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BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Do Aged Medicare Patients Receive More Costly Routine Nursing Services? Evidence Inconclusive

COMPLETED

Medicare now assumes that it is more costly for hospitals to provide routine nursing services to aged than to nonaged inpatients and pays hospitals a premium. This is called the Medicare routine nursing salary cost differential. However, the existence or nonexistence of an actual cost differential is not conclusively demonstrated by studies GAO analyzed.

GAO is reasonably confident that the methodology it has developed will determine whether there is a routine nursing cost differential on an industrywide basis and, if so, estimate its size. However, GAO cannot be certain that the methodology will produce results precise enough to calculate hospital reimbursements for routine nursing services. To enable GAO to make the study, the Congress would have to appropriate a substantial sum specifically for that purpose.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This report analyzes existing studies relating to the existence and size of a routine nursing salary cost differential and proposes a methodology that we would use if asked to make such a study. We prepared the report in response to section 2141 of the Omnibus Budget Reconciliation Act of 1981 (Public Law 97-35).

We are sending copies of this report to the Director, Office of Management and Budget, and the Secretary of Health and Human Services.

Charles A. Bowsher

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

DO AGED MEDICARE PATIENTS RECEIVE MORE COSTLY ROUTINE NURSING SERVICES? EVIDENCE INCONCLUSIVE

D I G E S T

Many in the hospital industry maintain that elderly patients, almost all of whom are covered by Medicare, require more daily routine nursing services than other hospital patients. Results of a 1966 American Hospital Association study reported that the elderly received more services. Based partly on this, Medicare pays a routine nursing salary cost differential.

This differential represents a significant cost to the Medicare program--an estimated $197 million in 1982--and an important income to hospitals.

The Omnibus Budget Reconciliation Act of 1981 (Public Law 97-35) reduced the differential from 8-1/2 to 5 percent and instructed GAO to study the existence and size of a routine nursing salary cost differential and submit the results within 6 months. This report critiques existing studies of the differential and describes a methodology that GAO would propose to use if it were to independently study this issue.

STUDIES DO NOT SUPPORT EXISTENCE OF A DIFFERENTIAL

None of the studies GAO identified adequately supports the existence of an industrywide routine nursing salary cost differential. Conversely, none of the studies conclusively shows that a differential does not exist. A recent study--conducted by the Health Care Financing Administration, which administers Medicare--provides relatively strong evidence that an industrywide differential does not exist. (See ch. 2.)

Only three of the studies analyzed, the 1966 American Hospital Association study, the 1975 Levine and Phillip study, and the 1981 Health Care Financing Administration study, were of sufficient scale to provide evidence on an industrywide basis. Of these three, only the

Association study supports the existence of a differential, and its support is significantly weakened by several limitations. The other two studies indicate that a differential does not exist, although the support provided by the Levine and Phillip study is also weakened by limitations. The Health Care Financing Administration study supplies relatively strong though not conclusive statistical evidence that an industrywide differential does not exist.

Of the other studies, only the 1980 Commission for Administrative Services in Hospitals study in California, which reported a differential, and the 1978 New Jersey study, which did not, are sufficiently extensive for their results to be relevant to an entire State. Both studies have serious limitations, although the New Jersey study is better. The other studies, almost all of which report a differential, are too small and have too many limitations for their results to be useful in determining the existence or size of a differential.

Overall, GAO believes that, on balance, evidence tends to be against the existence of an industrywide nursing cost differential. However, the studies of the issue, whether taken singly or together, do not provide conclusive evidence either for or against the existence of such a differential.

PROPOSED GAO STUDY

Were GAO to attempt to determine the existence and size of an industrywide nursing differential, it would propose to conduct a work-sampling study in routine nursing care units in a nationwide sample of hospitals. (See ch. 3.)

The study sample would be 90 hospitals grouped into four strata on the basis of reported routine nursing salary costs. This sample would be weighted toward large hospitals with a high proportion of Medicare patients and would exclude hospitals reporting less than $100,000 in routine nursing salary costs.

While GAO believes that the sample would produce sufficiently precise results to use for calculating hospital reimbursement for routine

nursing costs, there is still some doubt. To resolve this doubt, GAO would collect data on the first 30 hospitals in the study and use the data to estimate required sample size before continuing with the study. If the sample size required for the desired level of statistical precision were substantially higher than 90, GAO would reconsider whether the study should proceed.

GAO would contract for nurses who would randomly observe each member of the nursing staff of each nursing unit under study to determine what they are doing at the moment of observation. GAO would combine this observation data with data obtained from hospital records to determine the average cost of routine nursing for aged and for nonaged patients. The ratio of these costs would be the differential.

GAO estimates that such a study would cost about $8.3 million. Of this, $3.6 million would represent the cost of data collection and processing procured through contract for which a special congressional appropriation would be needed. The remainder represents GAO personnel and other internal costs.

GAO does not believe that the proposed sample is large enough to permit reliable estimation of the influence of hospital or patient characteristics on the size of any differential. A much larger sample at significantly higher cost would probably be necessary.

AGENCY AND PROVIDER ORGANIZATION COMMENTS

The Department of Health and Human Services (HHS) generally agreed with GAO's analysis of the prior studies and stated that it believes the Health Care Financing Administration study shows that no industrywide routine nursing cost differential exists.

Tear Sheet

The American Hospital Association, the American Nurses' Association, the Catholic Health Association, the Federation of American Hospitals, and the Hospital Financial Management Association also generally agreed with GAO's analysis of the prior studies except for the analysis of the Health Care Financing Administration study. These organizations raised a number of methodologic questions about that study and said they believed GAO is giving too much weight to it.

GAO continues to believe that the Health Care Financing Administration study provides relatively strong, although not conclusive, evidence that an aggregate routine nursing cost differential does not exist. (See pp. 14-20.)

HHS questions whether the benefits to be gained from the proposed GAO study justify the expected cost of the study. The provider organizations all support conduct of such a study. (See pp. 30-32.)

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ABBREVIATIONS

AHA	American Hospital Association
ANA	American Nurses' Association
CASH	Commission for Administrative Services in Hospitals
CHA	Catholic Health Association
DRG	diagnosis related groups
FAH	Federation of American Hospitals
GAO	General Accounting Office
HCA	Hospital Corporation of America
HCFA	Health Care Financing Administration
HFMA	Hospital Financial Management Association
HHS	Department of Health and Human Services
LPN	licensed practical nurse
RN	registered nurse

CHAPTER 1

INTRODUCTION

Many in the hospital industry believe that elderly patients, most of whom are covered by Medicare, require more routine nursing services on a daily basis than other hospital patients. The American Hospital Association (AHA) made a study in 1966 which reported that elderly patients received more nursing services. Although this study had limitations (see p. 7), it was used as a primary basis for justifying Medicare's decision to pay hospitals an additional factor for routine nursing services rendered beginning in July 1969--the 8-1/2-percent routine inpatient nursing salary differential. Since that decision, questions have arisen about whether the differential was justified or set at the appropriate level. Since 1969 many studies have been done in this area. Some studies reported that no differential exists, while others reported that the differential was higher than the level paid by Medicare. These studies are discussed and analyzed in chapter 2 and appendix I.

The question of the existence and size of a routine nursing salary cost differential assumes considerable importance for both the Government and the hospital industry because of the dollars involved. The 1982 Health and Human Services (HHS) 1/ estimates of differential costs show substantial sums, as shown in the following table.

Year	Estimated cost of differential at 5-percent level	Estimated cost of differential at 8-1/2-percent level
	(millions)	
1982	$197	$250
1983	220	285
1984	276	350

The existence and size of an equitable Medicare routine nursing salary cost differential are still in dispute. If one exists, then, under the principles of cost reimbursement written into the Medicare law, it should be paid. However, if it does not exist, the taxpayers should not pay a premium to the hospitals for the care of Medicare patients.

The Omnibus Budget Reconciliation Act of 1981 (Public Law 97-35) reduced the differential from 8-1/2 to 5 percent. 2/ The

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1/Before May 1980, Medicare was administered by the former Department of Health, Education, and Welfare. In this report, all references to the administrative department will be to HHS.

2/The differential for skilled nursing facility patients remains at 8-1/2 percent.

law also required us to make a study to determine at what level, if any, a differential is justified. This report is in response to that requirement.

BACKGROUND

In 1965, the Congress amended the Social Security Act to authorize under title XVIII the health insurance program for the aged known as Medicare. Medicare consists of two parts--part A, which covers inpatient hospital, skilled nursing facility, and home health care services, and part B, which covers physician and other health care supplier services. Because the routine nursing salary cost differential applies only to inpatient hospital and skilled nursing facility services, this report deals only with part A.

Beginning on July 1, 1966, most people 65 years of age and over became eligible for part A. The Social Security Amendments of 1972 (Public Law 92-603) provided coverage to two additional groups under Medicare:

--Persons under 65 who have received benefits under Social Security Disability Insurance for at least 24 consecutive months.

--Persons with end-stage renal disease.

A routine nursing salary differential is not paid for inpatient services provided to patients qualifying under the two new coverage categories.

Part A of Medicare is financed primarily by employee/employer taxes which are deposited in the Federal Hospital Insurance Trust Fund. Payments are made from the Trust Fund to hospitals and skilled nursing facilities normally based on their actual cost of providing services to Medicare beneficiaries. Costs must be related to patient care, and payments are limited to the reasonable costs incurred by an efficient provider of services.

Medicare reduced financial barriers to medical care for the aged, thereby increasing the demand for hospital services across the Nation. Physicians and hospitals found that many Medicare patients displayed the effects of long-term neglect of disease conditions, having postponed medical care and hospitalization they could not afford. Such patients entered hospitals in debilitated condition, requiring extensive nursing attention. Hospital interest groups complained that Medicare patients were overtaxing existing nursing services.

In response, HHS attempted to provide hospitals with a financial incentive to accept Medicare patients by allowing

reimbursement at 102 percent 1/ rather than 100 percent of the total costs attributed to Medicare patients. The hospital industry claimed that 2 percent was inadequate and said as much as 7 percent was needed. To document that Medicare patients received more nursing care, industry interest groups did several studies, the most important of which was the 1966 AHA study (see pp. 6 and 7). This study reported that on the average elderly patients received from 8 to 13 percent more hours of nursing care than other patients, depending on whether nursing time not assigned to specific patients was prorated on the basis of patient age mix or the proportion of assigned observations. Despite the statistical problems with this study, the hospital industry used it as support for a nursing cost differential for Medicare patients.

In 1971, the Secretary of HHS approved regulations retroactively effective to July 1969 replacing Medicare's 2 percent of total costs differential with an 8-1/2-percent differential on the salary costs of routine nursing care.

In 1975, HHS attempted to terminate payment of the 8-1/2-percent cost differential administratively. The Department argued that the effect of the Social Security Amendments of 1972, which expanded Medicare coverage to certain groups under 65 years of age, would tend to cause the Medicare population to more closely resemble the non-Medicare population, thus eliminating any need for a nursing differential. HHS also argued that, since 1969, there had been a marked increase in the number of special care units, such as intensive care and coronary care units, resulting in a substantial shift of more seriously ill patients from routine care units to these special care units. Since 1972, Medicare had paid separate rates for these units.

AHA successfully sued HHS in a Federal district court to block implementation of this change in regulations. The court ruled that HHS could not repeal the regulation without making further nursing utilization studies to justify its action.

In 1980, the Senate acted to eliminate the routine nursing salary cost differential by including in its version of the Omnibus Reconciliation Act of 1980 a provision that would have eliminated the differential until it was demonstrated that any existed. The provision called on the Comptroller General to make a study to determine the appropriate level for one or more differentials. Because of the short study time frame included in the Senate provision, we immediately began to develop a methodology for such a study. The Comptroller General notified

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1/The rate was 101.5 percent for proprietary providers.

the appropriate committees of our actions, the potential limitations of a study, and the need for supplemental funding to conduct a study.

The Senate provision for such a study was dropped by the conference committee on the differing versions of the 1980 Reconciliation Act. However, a similar provision was included in the Senate's version (S. 1377) of the Omnibus Budget Reconciliation Act of 1981 (Public Law 97-35). As finally enacted in August 1981, section 2141 of Public Law 97-35 reduces the routine nursing differential to 5 percent and instructs the Comptroller General to

> "* * * conduct a study to determine the extent (if any) to which the average cost of efficiently providing routine inpatient nursing care to individuals entitled to benefits under title XVIII of the Social Security Act exceeds the average cost of providing such care to other patients. The Comptroller General shall submit a final report with respect to the results of such study to the Congress within six months after the date of the enactment of this Act."

The report of the Senate Committee on Finance, as incorporated into the report of the Senate Committee on Budget (S. Rept. No. 97-139), states concerning this provision that

> "A similar provision for a Comptroller General study was included in the Senate version of the Reconciliation Act of 1980, which passed the Senate on June 30, 1980.
>
> "On July 16, 1980, the Comptroller General advised the committee that a study of the routine nursing costs which are attributable to the elderly could not be undertaken without additional financial resources--specifically funds to contract for temporary nursing personnel to make the work sampling observations at the study hospitals--which would cost about $4 million.
>
> "Although the provision for the GAO study was dropped during the House-Senate conference on the 1980 Reconciliation Act, the committee has been informed by the GAO that it had proceeded to develop a work sampling methodology for the study and had tested it at one hospital. This experience has confirmed the earlier conclusion by GAO that the use of trained nurses to make the observations in the hospitals, though quite costly, is the only feasible approach to accurately and reliably collect the data, avoid disruption to

hospital routines, and provide the patient privacy necessary for hospital and patient cooperation. Therefore, to assure the successful conduct of the study, it will be necessary to appropriate supplemental funds specifically for the purpose of obtaining the required contract assistance."

In an August 14, 1981, letter to the Acting Comptroller General, the Chairman, Senate Committee on Finance, expanded on this, stating that the Committee recognized that the appropriation process could significantly cut into the 6 months that the act allowed for the study. The letter went on to state that the Committee understood that, over the past several years, various studies had been undertaken by others to assess the magnitude of a nursing cost differential for Medicare patients. The Chairman stated that, therefore, the costly study we contemplated might not be necessary to meet the needs of the Committee and the Congress. The Chairman concluded that, to meet the statutory requirements of section 2141 of Public Law 97-35, we could provide the Congress within 6 months of enactment a report which

--summarized, analyzed, and critiqued all prior studies we identified relating to the Medicare nursing differential issue and

--contained a detailed explanation of our proposed study methodology, including estimates of the cost and our perceived limitations on the results, as well as the views of interested public and private agencies as to the adequacy and feasibility of the proposed study approach.

This report provides that material.

SCOPE AND METHODOLOGY

We obtained existing studies through literature search and contacts with hospital associations and knowledgeable individuals. We analyzed the studies based on analysis of the study design, knowledge of study design methods, and experience in the application and interpretation of statistical techniques. In addition, we discussed study methods and findings with study authors and other knowledgeable people, when appropriate.

In designing our proposed study, we used standard industrial engineering and statistical analysis methods. We developed the data analysis plan within the constraints of standard statistical practice and have included in this report a discussion of the plan's potential limitations. (See p. 29.) This review was performed in accordance with the Comptroller General's current standards for audit of governmental organizations, programs, activities, and functions.

CHAPTER 2

STUDIES DO NOT ADEQUATELY SUPPORT THE EXISTENCE OF A MEDICARE DIFFERENTIAL

None of the studies we identified adequately supports the existence or size of a routine nursing salary cost differential for Medicare patients on an industrywide basis. Conversely, none of the studies conclusively shows that a differential does not exist. However, the most recent study analyzed provides relatively strong statistical evidence that, in the aggregate, a differential does not exist.

Most studies that attempted to determine if a differential exists industrywide or statewide were unable to identify one, while those that tried to identify one for individual hospitals almost always did so. This could indicate that, although there is no aggregate, industrywide differential, one does exist for some hospitals. However, because of the methodological limitations in the single-hospital studies, even they do not support this conclusion.

A summary of our analysis of the major studies is presented in this chapter. Additional details about these studies, as well as the others we identified, are included in appendix I.

THE 1966 AHA STUDY

In 1966, in an effort to establish support for the existence of a Medicare routine nursing salary cost differential, AHA conducted a work-sampling study 1/ at 55 member hospitals.

The study reported that, when patients were grouped by age, there was relatively little difference in hours of routine nursing care provided up to age 55. Above that age, hours increased, and they increased sharply for the age 75 and over group. For all hospitals combined, the hours of care provided to those 65 and over exceeded all routine medical/surgical patients by 8 to 13 percent. 2/ The range in individual hospitals was from -2 to 34 percent.

1/Work-sampling is an industrial engineering technique whereby the nature of activities of persons being studied is recorded at random times over several days. Data so obtained will yield a reasonably accurate picture of the distribution of activities of the persons being studied.

2/The figures vary depending on whether observations not assignable to any patient are allocated in the same proportion as patient age-mix or as assigned observations.

The study estimated for the 50 hospitals with complete data, the increase in nursing hours and the amount of increased nursing costs based on two methods which varied in the procedure used to assign the portion of observations that could not be associated with a particular patient--that is, observations of idle time, time spent in general meetings and training, etc. First, when such observations were assigned based on the ratio of aged patient days to total patient days, nursing hours for the aged were 8 percent higher--the additional costs of this differential were $956,000. Second, when such observations were assigned based on the ratio of observations associated with caring for aged patients to observations associated with caring for all patients, nursing hours for the aged were over 13 percent higher--the additional costs of this differential were $1.4 million. However, the study does not present either cost as a percentage of total routine nursing salary costs by age of patient. Thus, we cannot determine what differential on a percentage basis the study found; that is, whether it would have been 8-1/2 percent or any other figure.

This study, which was a primary basis of the argument for the Medicare routine nursing salary cost differential, has several limitations. The first is its age. Many elderly patients who came into hospitals in the years immediately after Medicare was established showed evidence of longstanding neglect of medical conditions. Elderly patients now entering hospitals may not be in such poor condition considering that Medicare has reduced the financial barrier to hospital care for the aged for the last 15 years. Also, very sick elderly patients, many of whom were once cared for in the routine medical and surgical nursing units, are now often cared for in special care units, such as coronary care or intensive care, which are reimbursed as cost centers independent from the routine nursing cost center.

In addition several methodological limitations impair the study's reliability as a predictor of industrywide practices:

--The hospitals were not randomly selected.

--Where all routine nursing units in a hospital could not be observed, those that were observed were not randomly selected.

--The study was conducted during the period spanning the Thanksgiving and Christmas holidays, when patient case-mix is probably not representative of the yearly caseload.

--Observers consisted of hospital personnel, a possible source of bias.

While this study provides some support for the existence of a routine nursing salary cost differential in 1966, changes in health care need and provision, as well as methodological problems with the study, diminish its relevance today.

THE LEVINE AND PHILLIP STUDY

In February 1975, Harry D. Levine and P. Joseph Phillip, of AHA, published a study entitled "Factors Affecting Staffing Levels and Patterns of Nursing Personnel." Using a variety of hospital and demographic characteristics, the study tried to predict hospitals' nursing staff needs. This study used standard statistical techniques on data from four sources:

--A survey of nursing personnel employed in hospitals conducted jointly in 1970 by HHS' Bureau of Health Resources and AHA.

--Annual survey of hospitals, AHA, 1970.

--"Health Resources Statistics," HHS, 1971.

--"Census of Population, 1970," Bureau of the Census, Department of Commerce.

After merging data from these four sources, 3,800 short-term general hospitals in the continental United States registered with AHA remained for analysis out of the initial 5,543 in AHA's annual survey. These were divided into three groups based on teaching affiliation and type of ownership.

Within each of these three groups, the study attempted to predict nursing hours for staffing purposes for each of six different types of nursing personnel (e.g., registered nurses (RNs), licensed practical nurses (LPNs), aides, and orderlies). The result was 18 separate models, each used to predict a particular type of nursing hours in a particular type of hospital. For example, the variables reported to predict aide, orderly, and attendant hours for nonteaching, nonprofit hospitals were (1) total admissions, (2) occupancy, (3) length of stay, (4) adjusted patient days, (5) percent of population 65 and over in the county where the hospital was located, (6) number of RNs per 100,000 State population, (7) number of LPNs per 100,000 State population, (8) number of aides, orderlies, and attendants per 100,000 State population, and (9) percent of population below the poverty level in the county.

In five of the six models where the proportion of the county population 65 and over appeared, an increase in that proportion was associated with a decrease in nursing hours per adjusted patient day. The authors hypothesized that patients between the

ages of 18 and 64 come to the hospital with more serious ailments and demand closer attention by the nursing staff than do patients under 18 or over 64.

For purposes of determining the existence and amount of a Medicare routine nursing salary cost differential, this study has several weaknesses. Its conclusion about the effect of age on nursing hours is seriously weakened by the fact that it used the percent of county population under 18 or over 64 years rather than the actual hospital patient days for those under 18 or over 64. The age proportion of a hospital patient mix is not systematically related to the age proportion of the county in which the hospital is located. Utilization statistics show that the elderly use hospital services in a manner disproportionate to their representation in the population. Furthermore, hospitals may draw a significant proportion of their patients from outside the county. Hospital characteristics and local patterns of medical practice can also influence patient age mix from hospital to hospital.

In addition, the study included special care units and was not limited to medical/surgical routine nursing hours. This can bias the results for the purpose of examining the existence of a differential restricted to routine nursing hours.

Furthermore, the way the study was performed and the mathematics of the methodology used give us reason to suspect unstable results from which we should not draw causal inferences. The authors were not concerned with causal relationships when they developed their predictive equations. They were concerned only with high correlation; however, correlation does not mean causation. 1/ More importantly, the equations from which the conclusion about the effect of age is drawn demonstrate a violation of a basic rule of the statistical methodology used. Some of the "independent" variables used--usually total admissions and adjusted patient days--were closely related to one another; that is, they were highly interrelated and not truly independent, a situation which results in unstable estimates.

Finally, this study examined nursing hours, while the crucial factor in the Medicare inpatient routine nursing salary cost differential is nursing costs. It could be, for example,

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1/Correlation refers to a mutual relationship among variables. If one variable tends to increase as another variable tends to increase, there is a positive correlation between the two. If one variable tends to increase while another tends to decrease, the two are negatively correlated. Tendencies to move in the same or opposite directions do not necessarily imply a causal relationship between variables.

that elderly patients use more hours of relatively more costly nursing staff, such as RNs and LPNs, and less of the relatively less expensive staff, such as nurses' aides and orderlies, leading to a nursing differential in terms of costs but not of hours. The opposite could also be true.

We believe that this study has too many limitations to permit any stronger conclusion than the suggestion that a nursing differential does not exist.

THE NEW JERSEY STUDY

In 1976, the New Jersey Department of Health, under contract with the Health Care Financing Administration (HCFA), undertook the development of a reimbursement methodology based on diagnosis related groups (DRGs), rather than on the traditional patient day. To develop this methodology, New Jersey conducted two studies in the last half of 1977:

--The Patient Classification System Acuity Nursing Pilot Study collected data on patient diagnoses, surgical procedures, age, and time for nursing activity for each of 3,497 patients. Nursing personnel recorded the minutes of direct care provided on each shift for each patient for his/her entire length of stay.

--The Joint Nursing Performance Analysis Pilot Study was a work-sampling study which developed time values for constant routine nursing activities and variable nursing tasks to validate the time measures of the first study and examine the relationship between direct and indirect time.

The result of these two studies was a data base of observations for individual patients with information on diagnoses, age, length of stay, surgical procedures, and other patient characteristics. These data were then combined with hospital cost data to derive an average cost per diagnostic group for rate setting. This average cost was then used to investigate the presence of a nursing salary differential due to age. The result of this final step was that, after controlling for case mix, patients 65 and over consumed only about 97 percent of the average nursing salary cost consumed by all groups.

This study has several limitations. It included data from patients in intensive care units, which are separately reimbursed by Medicare. This introduced a possible bias into the results for our purpose, which is to examine only routine nursing salary costs. Also, while the authors felt the cross-section of services and case mix in the sample was representative of New Jersey acute-care hospitals, the sample hospitals were not randomly

selected. In addition, because the sample includes only New Jersey hospitals, it is not possible to extend the results beyond that State. Finally, while this study was intended as part of an effort to create for New Jersey a new hospital reimbursement system based on patient diagnosis rather than on the traditional patient day, its results were not final. The study is continuing, and a later, more sophisticated version is to be used as the basis for the New Jersey reimbursement system. We do not believe that the preliminary study methodology is precise enough to offer more than a strong suggestion that, in New Jersey, there is no routine nursing salary cost differential for Medicare patients.

THE CASH STUDY

In April 1980, the Commission for Administrative Services in Hospitals (CASH), a nonprofit California corporation designed to serve client hospitals by supplying information pertaining to the more efficient and economical operation of hospitals, issued a study on the Medicare routine nursing differential. CASH used a preexisting file of data on 125 California hospitals, about 25 percent of all California short-term acute-care hospitals. This file contained a partial year's data on total medical/surgical nursing hours, total medical/surgical patient days, and the ratios of Medicare aged patient days to total patient days.

The study grouped these hospitals in five cells by their ratio of Medicare patient days served and calculated the median average nursing hours per patient for each cell. It then used standard statistical methods to estimate the association between the proportion of Medicare patient days and median average nursing hours. It concluded that, "Assuming other staffing factors to be equal our findings indicate that Medicare aged patients are provided 29 percent more nursing resources per patient day than are patients under Medicare age."

We believe that this study contains several limitations. There is no evidence in the study that the hospitals were randomly selected or representative of California hospitals. It is not clear that these data are restricted to routine medical/surgical nursing hours and patient days, the only days to which the Medicare differential applies. Because of uncertainty regarding the limits of confidence in the study results, we believe it does not support its conclusion that patients 65 years and over receive 29 percent more nursing resources than patients under 65. Furthermore, as pointed out above, a statistical association, or correlation, between Medicare patient days and more use of nursing resources does not necessarily indicate a causal relationship between them. Finally, the study measured the change in median average nursing hours against the change in the ratio

of Medicare patient days to other patient days. The question at issue is one of costs of care, rather than hours of care. Thus, while this study may offer some support for the existence of a nursing differential in terms of hours, we do not believe that it supports a nursing differential in costs.

THE HCFA STUDY

In October 1981, HCFA's Office of Research, Demonstrations and Statistics issued "A Statistical Analysis of the Medicare Hospital Routine Nursing Salary Cost Differential" (dated Aug. 31, 1981) by Dr. J. Michael Fitzmaurice, Chief of the Institutional Studies Branch. This study examined data from 1977, 1978, and 1979 Medicare hospital cost reports; the 1979 AHA annual survey of hospitals; and the 1978 Medicare case-mix index. The study tested the hypothesis that a hospital's per diem routine nursing salary costs increase when that hospital's proportion of routine Medicare patient days increases. To isolate the relationship of interest between the proportion of routine Medicare patient days and per diem routine nursing salary costs, the study used regression analysis, a statistical technique which attempts to hold constant the influence on routine nursing salary costs of other hospital, patient, and regional characteristics, such as local area wages, hospital size, and Medicare case-mix.

The study reported that an increase in the proportion of hospital routine patient days consumed by Medicare patients was not significantly associated with an increase in per diem routine nursing salary costs. It further stated that the size of the association identified and its lack of statistical significance do not support a Medicare routine nursing salary cost differential payment of 8-1/2 percent. Several other variables, such as regional location, type of hospital control (e.g., governmental, nonprofit, for profit), hospital occupancy rates, and local area wage levels, appeared to explain more of the variation in per diem routine nursing salary costs across hospitals than did the proportion of routine Medicare patient days.

Although this study represents the most ambitious effort to ascertain the existence and size of an aggregate Medicare routine nursing salary cost differential to date, it too has some limitations. At best, this analysis explains only about 40 percent of the variation in routine nursing cost per day. This low explanatory power may mean that potentially important variables have been excluded from the analysis. On the other hand, it may simply reflect a large amount of random fluctuation in routine nursing salary costs among hospitals, which makes detection of a differential on an industrywide basis difficult.

This study is the most relevant and complete attempt to detect the existence and size of an industrywide Medicare

routine nursing salary cost differential to date. While commentators criticized the HCFA study because of its low explanatory power, we believe, as discussed on pages 15 and 16, that this study provides relatively strong, though not conclusive, evidence that little or no overall Medicare routine nursing cost differential exists.

OTHER STUDIES

Other studies on the Medicare inpatient routine nursing salary cost differential exist, but because of design limitations, their results are not widely applicable. Each suffers from a combination of the following limitations:

--Small sample size.

--Nonrandom sampling.

--Differential found in terms of hours but not costs.

--Use of a study methodology not sufficiently precise for the purpose (e.g., patient acuity classification system 1/).

--Poorly designed or documented statistical analysis.

In the aggregate, at most these studies suggest that a routine nursing differential, in terms of hours, may exist in some hospitals. They also suggest that this differential varies widely across hospitals. These studies are too small and too limited for their results to be useful in determining whether an industrywide cost differential exists.

CONCLUSIONS

None of the studies discussed in this chapter adequately supports the existence of a Medicare routine nursing salary cost differential. Conversely, none of them conclusively shows that such a differential does not exist. Overall, we believe that the 1981 HCFA study reporting that an industrywide differential does not exist is the statistically most relevant, although it does not provide conclusive evidence.

Only three studies, the AHA study, the Levine and Phillip study, and the HCFA study were of a sufficient scale to provide

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1/Patient acuity classification systems are designed to help hospital administrators determine optimum patterns of nurse staffing. See appendix I, pp. 43 to 45, for a more detailed description.

evidence on an industrywide basis. Of these three, only the AHA study provides any support for the existence of a differential and that support is significantly weakened by the study's limitations. The other two studies indicate that a differential does not exist, although support provided by the Levine and Phillip study is weak. The HCFA study does supply reasonably strong support that an aggregate differential does not exist.

Of the others, only the CASH study and the New Jersey study are extensive enough for their results to have some validity for an entire State. However, the California-based CASH study is too limited to justify much confidence in its results. The New Jersey study is better and provides some evidence for the nonexistence of a differential in that State.

We believe that the other studies are too small and too limited for their results to be useful in determining whether a differential exists. Almost all of these studies report a nursing differential, but generally in terms of hours rather than costs. This is not satisfactory because care to the elderly may be predominately furnished by less skilled and lower paid nursing personnel. In addition, all of these studies have limits that seriously impair their reliability even as reporters of a differential in terms of hours.

In summary, although we believe that on balance the existing evidence tends to be against the existence of an industrywide Medicare routine nursing salary cost differential, these studies, whether taken singly or together, do not provide conclusive evidence either for or against the existence of such a differential.

AGENCY AND PROVIDER ORGANIZATION COMMENTS AND OUR EVALUATION

HHS generally agreed with our analysis of the existing studies. It believes the HCFA study is the most definitive to date and shows that an industrywide routine nursing cost differential does not exist.

AHA agreed with our conclusion that none of the existing studies provides conclusive evidence about the existence of a routine nursing cost differential. However, AHA believes that, taken collectively, the studies tend to accord the existence of a differential greater validity rather than less validity as we concluded. Although most of the studies we analyzed report a differential, most are so methodologically limited that, in our opinion, they cannot be relied on for evidence about the existence of a differential, particularly an industrywide differential. Almost all of the studies were undertaken to address other issues or use methodologies developed for other purposes

(for example, to predict required nurse staffing levels), so their methodologies were not designed to rigorously test for a differential. The most current study undertaken to examine the issue of a differential--the HCFA study--did not identify one.

AHA disagrees on two bases with our conclusion that the HCFA study provides relatively strong statistical evidence that a routine nursing cost differential does not exist in the aggregate. First, AHA believes the HCFA study contains technical flaws which raise questions about its methodologic validity and the reliability of its conclusions. AHA cites as technical flaws the interdependence among the explanatory variables and the omission of certain variables which lead to potentially unstable estimates, sampling bias, and the possibility of population heterogeneity (that is, differences among hospitals in their approaches to routine nursing cause differences in the size of their differential).

The Hospital Financial Management Association (HFMA), the Catholic Health Association (CHA), the Federation of American Hospitals (FAH), and the American Nurses' Association (ANA) raised many of the same or similar questions about the HCFA study as AHA did. All of these organizations believe we are giving too much weight to the HCFA study. As discussed in this chapter and in appendix I, we recognize that the HCFA study has limitations and that there are honest differences of opinion about it. However, overall the HCFA study is, in our opinion, the most relevant when considering the existence of an industry-wide routine nursing cost differential.

There were two common technical criticisms of the HCFA study. One concerned the relatively low amount of explanatory power of the HCFA models--at best, about 40 percent. This was taken as a sign that potentially important explanatory variables had been excluded from the models--that is, that the models were misspecified. The other criticism was of interdependency among those explanatory variables included in the models (a problem called multicollinearity), which could lead to unstable estimates. In addition, AHA criticized the data used because of sampling bias and population heterogeneity.

Low explanatory power is a valid criticism of a study, particularly when the prime purpose of that study is to predict values for the dependent variable. As discussed on page 12, a low proportion of explained variation may be a sign that one or more important explanatory variables have been left out of the model. It may also be an indication of a large amount of non-systematic variation among hospitals which cannot be explained by one or more variables.

Commentors tended to view the low explanatory power as an indication of missing variables--model misspecification. AHA suggested as new variables a measure of hospital services, a measure of volume and case mix, and a measure of the number and specialty mix of the medical staff. The HCFA study included measures of special care unit utilization, occupancy rate, Medicare case mix, and Medicare intensity as well as staffing variables reflecting nursing supply and intern and resident supply. These included variables would appear to serve as proxies for some of the variables suggested by AHA.

HFMA suggested that the low explanatory power indicated that regression was an inappropriate technique to use and that the regression results should not be given too much weight in any policy debate. Individual variables can be tested for their effect regardless of the proportion of variation explained by the equation as a whole. Many estimates of the effect of individual variables remained relatively stable through the different specifications and data sets used in the HCFA study. Several, such as regional location, occupancy rates, and local wage rates, were consistently statistically significant in explaining differences in routine nursing costs; therefore, it appears that, if a strong relationship existed between the proportion of Medicare days and the per diem routine nursing salary cost, it would have been shown in the HCFA model.

In view of the stability of many estimates of the effects of individual variables, as well as the range of variables included in HCFA's model, we believe that the low explanatory power of the HCFA model could well be due to nonsystematic variation among hospitals rather than to variation due to one or more specific excluded variables.

The second common criticism of the HCFA study is that, among the variables included to explain variation in per diem routine nursing salary cost, there is potentially large interdependence, or multicollinearity. Multicollinearity can make it harder to establish the statistical significance of an individual variable because it can bias the results of the statistical test used to measure significance. As a result, a variable may appear insignificant when a significant effect was expected.

Examining the relationship among pairs of explanatory variables is a standard method of checking for unacceptable levels of multicollinearity. While in theory there should be no correlation among independent explanatory variables, in practice it is a question of what constitutes an acceptable degree of collinearity. Correlation can be a result of chance, or it can be an indication of a systematic relationship between pairs of explanatory variables. The acceptable level is a question of

judgment on which reasonable persons disagree. In the HCFA study, the correlations between variables were relatively low, and in our opinion did not indicate that multicollinearity was a serious problem with the variables used.

AHA also criticized the actual data used because of potential sampling bias and population heterogeneity. The universe of data used in the HCFA study consisted of 4,521 hospitals; 1,330 hospitals had to be removed from the data base because of incomplete or incompatible data when the three separate data sources were merged. This process of data removal may have biased the sample used, but we believe it was better to remove hospitals with incomplete or obviously erroneous data because not doing so could have an adverse effect on the reliability of the results.

The HCFA study does supply some evidence that the relationship, although generally not statistically significant, between per diem routine nursing salary cost and the proportion of Medicare patient days varies from positive to negative when hospitals are grouped by bed size. The fluctuation in this relationship indicates that the population may well be heterogeneous. However, in the aggregate, the study does not identify a statistically significant differential. Since the differential is paid on an aggregate basis--all hospitals get the same percentage--the aggregate results are the ones of interest.

AHA's second basis for questioning the validity of the HCFA study is its belief that the HCFA study's logic is flawed in assuming that a differential exists only when it can be demonstrated in the aggregate that hospitals with higher proportions of Medicare patients have higher nursing costs. AHA cites three circumstances which it believes can result in Medicare patients receiving more nursing care per day despite any similarities found in aggregate nursing costs per day among hospitals with varying portions of Medicare patients. First, AHA points out that hospitals in many areas of the country are experiencing shortages of nurses which can create artificial limits on how many nurses they employ irrespective of the portions of their beds occupied by Medicare patients. In hospitals with shortages of employed nurses, we assume that the hospitals are providing their patients with the routine nursing care they need through the use of overtime and/or the use of temporary nurses hired through nursing pools. The costs of these alternatives should be reflected in the hospital's routine nursing services. If, however, patients are not receiving all the routine nursing care they require because of nurse shortages, the existence of a routine nursing cost differential could be masked in a statistical study. The extent of such masking would depend on the degree of differences among hospitals in nurse shortages.

The second circumstance cited by AHA is that Medicare has a limit on the amount it will pay hospitals for routine services and this limit creates an artificial constraint on how hospitals staff their routine care units irrespective of the portions of beds occupied by Medicare patients. Again we assume that hospitals are providing their patients with the care they need. If the Medicare routine service reimbursement limit has resulted in hospitals shifting staff from routine areas to ancillary areas, this would have no bearing on whether a differential should be paid. This results because ancillary services are paid based on charges per unit of service. If Medicare patients receive more of these services, the hospital is paid for them.

The third circumstance cited by AHA is that hospitals staff to meet all patient care needs with a high degree of statistical probability and that temporary fluctuations in hospital census and/or patient mix do not affect staffing levels. Because the HCFA study used annual data, we do not believe that any short-term fluctuations experienced by hospitals would have a significant impact on the results of the study.

Both AHA and HFMA criticized the applicability of regression analysis to the study of the nursing differential. AHA, for reasons noted above, did not think the data used would accurately reflect the nursing salary cost of Medicare patients. HFMA believed that using interhospital comparisons was inappropriate since the rationale for paying the differential is that Medicare patients require more routine care than other patients in the same hospital. We believe that regression can be a statistically valid technique for analyzing whether a routine nursing salary cost differential exists. A differential for Medicare patients in per diem routine nursing salary costs should be evident after other factors believed to affect nursing costs, such as wage levels or case mix, have been accounted for.

CHA made two other comments on the HCFA study. First, CHA disagreed with the HCFA study's reliance on logarithmic models instead of linear ones 1/ and stated that HCFA did not present any methodologically based rationale for relying on the log form which, in the study results, provides stronger evidence

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1/A linear model is used when there is a constant relationship between the independent explanatory variables and the dependent variable--each one unit change in an independent variable is associated with the same absolute size change in the dependent variable. A logarithmic model can be used to examine a relationship which is not constant.

for the contention that the differential is unwarranted. Second, CHA stated that HCFA did not emphasize one model specification which included a length of stay variable because it supported the existence of a differential.

The HCFA study presented results of three different "comprehensive" models using 1979 universe data, and the results of one of these three models using sample data for 1977, 1978, and 1979. Each model was estimated in both log and linear form, so there are 12 estimates of the relationship between the proportion of Medicare patient days and per diem routine nuring salary cost--six models using universe data and six using sample data which oversampled for large hospitals. HCFA preferred the log forms of these models because economic theory maintains that the log form is more appropriate than the linear form for analyzing cost functions.

Of the six models using universe data, one linear model demonstrated a relationship between the proportion of Medicare patient days and per diem routine nursing salary cost that was significant at the 95-percent confidence level. The other two linear models and the three log models did not have statistically significant results for this relationship. Of the six models using sample data, two of the three linear models and one of the three log models had a statistically significant relationship between proportion of Medicare patient days and per diem routine nursing salary cost. With the sample data, then, three models were significant and three were not; with the universe data, one model was significant and five were not. The universe results are more applicable to the question of the existence of an industrywide nursing differential because of the oversampling for large hospitals in the sample data which was not compensated for by weighting of the data.

The only one of six models using universe data that had significant results was the linear form of the model that included as explanatory variables (1) average length of stay and (2) Medicare length of stay in proportion to average length of stay. Including these two variables did not change the model's explanatory power (it remained at 42 percent of the variation explained) and resulted in little change in the effect of most independent variables on per diem routine nursing salary cost. There was, however, a rather large change in the estimated effect of the proportion of Medicare patient days on per diem routine nursing salary costs--in the log form the relationship is almost significant at the 90-percent level of confidence; in the linear form it is significant at the 99-percent level. In neither case is the effect of the change very large.

CHA believed HCFA ignored the results of the model including the length of stay variables because they strongly support the existence of a differential. We do not believe that the only model (out of the six presented in the HCFA study using universe data) which lends support for the existence of a differential should be accepted as the definitive model of the HCFA study. In addition, HCFA questioned the reliability of the data used to develop the average length of stay variables (that is, number of admissions and total days of care provided). Even after extreme values were removed, HCFA had little confidence in the accuracy of reported numbers for admissions. The apparent likelihood of erroneous data in the length of stay variables; the consistency of the effect of independent variables on routine nursing costs per day across models and data sets, except for the proportion of Medicare patient days; and the general lack of statistical significance across models for the effect of the proportion of Medicare patients days, all seem to indicate that the HCFA study as a whole does not support the existence of a differential.

HFMA also commented that, because the HCFA study used 1979 data, it did not reflect a recent change in Medicare policy. Effective October 1, 1980, Medicare's definition of an intensive care type unit was changed. HFMA said that patients who were in intermediate care type units--that is, units providing a higher level of service than routine units but not as high as intensive care type units--would now have to be classified as routine patients. HFMA maintains that this could increase the differential for some hospitals. Although some hospitals were being reimbursed for intermediate care type units separately from routine units, this should only affect the question of the existence of a differential if proportionately more Medicare patients were in intermediate care units than were in routine units. In any case, this Medicare policy change should affect only a small percentage of Medicare patient days.

In summary, although the provider organizations commenting on this report raised some reasonable questions about the HCFA study (similar to the limitations on that study we observed on p. 12), we continue to believe for the reasons cited above that the HCFA study provides relatively strong statistical evidence that an aggregate routine nursing cost differential does not exist. The low explanatory power of the HCFA study is the primary reason we consider it not to be conclusive evidence that a differential does not exist. The arguments used by the commentors are possible reasons for this low explanatory power, but as discussed above, are not the only, or necessarily the correct, reasons.

CHAPTER 3

THE PROPOSED GAO STUDY

To determine if a nationwide Medicare routine nursing salary cost differential exists and, if so, its size, we would make a work-sampling study in a stratified sample of 90 hospitals nationwide. Such a study would be costly and would require a special appropriation to enable us to contract for nursing personnel to act as observers. Although we are reasonably confident that the proposed study methodology would yield results statistically reliable enough to be used to compute an industrywide ratio of aged Medicare routine nursing costs to such costs for other patients, we cannot be certain of this.

OBJECTIVES AND SCOPE

The primary objective of the study would be to determine the aggregate industrywide difference in salary cost, if any, between providing routine nursing care to hospital inpatients 65 years of age and older and providing such care to other patients (excluding nursery patients).

We believe that trying to determine a cost differential on a different basis--such as by individual hospital, location or type of hospital, or patient characteristics--would require a prohibitively large and expensive study. In addition, a differential designed on such a basis would probably be difficult and expensive to administer.

The study is designed to meet the objective of determining an industrywide aggregate differential by providing the data necessary to compute the following ratio:

$$\frac{\text{routine nursing salary cost per aged patient hour}}{\text{routine nursing salary cost per nonaged patient hour}}$$

To obtain this ratio, the study would use work-sampling techniques to estimate the number of nursing care hours provided to aged and all other patients in routine nursing units in 90 sample hospitals. The study would determine hours of care for aged and nonaged patients by the various categories of nursing care provider (e.g., registered nurse and orderly). These hours of care would then be multiplied by the average salary cost for that type of routine nursing provider for that hospital. and these costs would be summed across hospitals 1/ to obtain total

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1/The data for each hospital will be weighted so that their influence on the final ratio will be proportional to the hospital's size relative to the universe.

salary costs for each age group. Each sum would be divided by total patient hours for the respective age group to determine the cost per patient hour of care.

The study group in each hospital would be the staff and patients in routine nursing care units. For purposes of this study, "routine nursing care" is defined as care performed in nursing units not associated with the nursery or with services for which a separate charge is customarily made (e.g., therapy, laboratory procedures, and radiology). Hospital beds that are not Medicare certified will be excluded from the study, as will the staff and patients in intensive care type inpatient hospital units as defined in 42 CFR 405.430.

The Medicare routine nursing salary cost differential also applies to skilled nursing facilities. However, because relatively few skilled nursing facility inpatient days are Medicare reimbursed and because the per diem nursing salary cost in such facilities already reflects the high proportion of elderly in these facilities, we believe that the cost of the differential for such facilities is very small. Furthermore, an official of HCFA's Office of Financial and Actuarial Analysis told us that HCFA did not compute the cost of the differential paid to skilled nursing facilities because they believed it to be negligible. For this reason, we believe that including skilled nursing facilities in the study would not be cost effective.

Section 2141 requires us to determine the differential for efficiently provided nursing care. For purposes of this study, we will assume that any hospital operating at or below Medicare's reimbursement limits for routine operating costs is providing routine nursing care efficiently.

HOSPITAL SAMPLE SIZE

We believe that a stratified sample of 90 hospitals will permit us to estimate the aggregate routine nursing cost differential with enough precision to be used to calculate hospital reimbursement for routine nursing services on a nationwide aggregate basis, but we cannot be certain.

In cases where the precision cannot be reliably estimated in advance, standard statistical procedure suggests using a preliminary sample, which can then be used to determine the adequacy of the planned sample size to attain acceptably precise results. If we were directed to do such a study, to deal with the uncertainty in appropriate sample size, we would collect data in three separate waves of about 30 hospitals each. At the end of the data collection period of the first wave, we would process the data as rapidly as possible to estimate precision and minimum sample size, while continuing preparations for the second and third waves. As

soon as this estimation is made, we would reconsider whether the study should proceed. If the precision is so poor as to require a substantially larger sample size than funded by the Congress, we would consider terminating the study before starting the second wave of data collection. This procedure would ensure that, if the planned sample turns out to be too small to produce results precise enough to be useful, a substantial part of the funds appropriated by the Congress especially for contracting costs for this study could be returned to the Treasury, and our resources which would otherwise be devoted to the study could be used for other purposes.

HOSPITAL SELECTION METHODOLOGY

Each year HCFA prepares a file from the most recently available cost reports for almost all short-term, acute-care, Medicare-certified hospitals. The current file is based on 1979 (in some cases 1978) unsettled cost reports. According to a HCFA official, a new file, primarily containing data from 1980 cost reports, will be available in January 1982. We will use the latest available version of this file as the basis for the universe for the study sample.

To eliminate from the universe hospitals with few Medicare patients, we will not include any hospitals with less than $100,000 in reported Medicare routine nursing salary costs. We will then divide the remaining hospitals into four strata based on dollar amount of Medicare routine salary costs. The proportion of the 90-hospital sample in each stratum will be determined by the percent of total Medicare routine nursing salary costs reported by the hospitals in the stratum. The strata, together with the strata size and sample size based on the 1979 file, are given below.

Costs reported	Number of hospitals	Total Medicare routine nursing salary cost reported ($1,000)	Percent of Medicare routine nursing cost reported by sampling universe	Number of hospitals in sample
$100,000-$199,999	1,164	$ 168,958	5.14	5
$200,000-$999,999	2,610	1,216,428	37.00	33
$1,000,000-$1,999,999	758	1,052,638	32.02	29
$2,000,000+	303	849,654	25.84	23
	4,835	$3,287,678	100.00	90

These 4,835 hospitals represent 82.5 percent of the 5,860 hospitals in the file and account for about 98 percent of the reported total Medicare routine nursing salary dollars.

In our initial planning for this study in 1980, we obtained the agreement of AHA, FAH, and CHA to help us gain the cooperation of the selected hospitals. Efforts to obtain cooperation will include letters to each selected hospital and contacts with State hospital associations. We will make every effort to persuade hospitals initially selected to participate because, if more than a few decline to participate, our ability to generalize from the sample to the universe of hospitals may be seriously compromised. Any selected hospital which elects not to participate in the study will be replaced by another randomly selected from the same stratum.

Although we believe that this sample will be adequate to determine the existence and size of the differential with acceptable precision, we cannot be certain that it is large enough to insure that we can develop any conclusions about the relationship between the differential and other factors, such as hospital size, geographic location, patient length of stay, or patient case-mix. Although we will analyze the data developed to test for such relationships, the results of our proposed study probably would not be useful in designing a differential to be paid on some other basis than the patient day presently used.

DATA COLLECTION METHODOLOGY

This project will be a work-sampling study of the providers of nursing care (RNs, LPNs, nurses' aides, orderlies, etc.) who perform nursing activities in nursing units not associated with the nursery or with services for which a separate charge is customarily made. Nursing personnel assigned to intensive care units, coronary care units, or other intensive care type inpatient units will be excluded. To the extent possible, the study will cover all routine nursing units in the hospitals selected for the study.

Observers

We would use RNs and LPNs as observers. We believe that the complexity of the study and the judgments to be made require observers with this level of skill. In addition, we believe that medically trained personnel will be more accustomed to the hospital setting, less disruptive of hospital routine, and more acceptable to hospital personnel and patients.

To eliminate the bias which might be introduced by using nursing personnel employed by the hospital being studied and to provide the largest possible recruiting base, we would contract for nursing personnel. We estimate that the study would require about 210 observers for each data collection wave. To assure that there will be enough observers despite attrition, sickness, and other unforeseen circumstances, we would arrange to have 230 trained observers available at the start of each data collection wave.

Observer training

We will conduct a 1-day observer training session as near as possible to the actual start of each of the three planned waves of data collection. Only enough nurses will have to be trained for the second and third waves to cover attrition in the previous waves.

In addition, the first 2 days of data collection at the study hospitals will be used to familiarize observers with the procedures and iron out any remaining problems and misunderstandings. The data from these first 2 days will be discarded. Fourteen days of continuous data collection will follow.

Observation methodology

The basic data collection methodology will be work-sampling. Observers will randomly observe each member of the nursing staff of each hospital unit in the study to determine what they are doing at the moment of observation. Observations will be made

several times in each unit on each shift for all three shifts each day for 14 continuous days. Observations will be coded as follows:

1--Care directly attributable to a specific patient performed in that patient's presence.

2--Care directly attributable to a specific patient, but not performed in that patient's presence.

3--Activities not related to a specific patient.

4--Staff member cannot be located for observation.

5--Observer traveling between units and not able to make an observation at the scheduled time.

Observations of care related to a specific patient ("1" and "2") will include that patient's room and bed designation. We will later match these data with information obtained from the hospital to determine the age and other characteristics of the patient.

Each observation will categorize the type of nursing staff member performing the activity. To facilitate this, each nursing staff member will be asked to wear a color-coded tag indicating job title. We will later match these data with the average pay rate for that job classification at that hospital to weight the observations by cost. In addition, to insure that each staff member is observed only once during a unit round, the observer will record the staff member's name. At the end of a unit round, the observer will proceed to the next unit and repeat the process. Order of unit observation for each day will be randomly determined, as will the schedule of observer rest and lunch breaks, within the limits imposed by the availability of hospital dining facilities.

Hospital and patient data

We will assign an identification number to each hospital, unit, and bed selected for the study. We will record all necessary hospital and patient data, updating the latter daily. As part of these data, we will obtain such information as hospital type, patient length-of-stay, and patient diagnosis, and test for a statistically significant relationship to routine nursing salary cost. The patient specific data will not be personally identifiable. (See app. II, pp. 50 to 52, for a detailed description of data elements.)

THE MEDICARE DIFFERENTIAL

The differential as presently calculated

To compute the inpatient routine nursing salary cost differential, Medicare first computes an adjusted inpatient routine nursing salary cost per day equivalent to the following:

$$(1) \quad \frac{(\text{Total inpatient routine nursing salary cost}) \times 1.05}{(\text{Total inpatient days}) + (0.05 \times (\text{aged} + \text{pediatric} + \text{maternity days}))}$$

Medicare then computes the average inpatient routine nursing salary costs per day by the following formula.

$$(2) \quad \frac{\text{Total inpatient routine nursing salary cost}}{\text{Total inpatient days}}$$

A per diem differential adjustment factor is then obtained by subtracting the average inpatient routine nursing salary cost per day (formula 2) from the adjusted inpatient routine nursing salary cost (formula 1).

This per diem differential adjustment factor is multiplied by the number of Medicare days to determine the Medicare routine nursing cost differential paid to the hospital. This differential is added to the product of the average inpatient routine nursing salary cost per day and the number of Medicare days. This sum is the hospital's total Medicare payment for inpatient routine nursing salary costs.

The differential as calculated by the proposed study

The proposed study is designed to produce the ratio:

$$\frac{\text{routine nursing salary cost per aged patient hour}}{\text{routine nursing salary cost per nonaged patient hour}}$$

As can be seen, this ratio is not directly comparable with the ratio of formula 1 above. We will not attempt to determine the differential in terms of formula 1 because we do not believe that we will find enough pediatric and maternity days in our proposed study to produce sufficiently precise results for these groups. This means that, if our proposed study finds that a differential exists, the ratio which we obtain will not be directly comparable to the 5-percent differential and will not be usable in the formula presently used to compute the differential. Such a result could be used as a direct add-on to Medicare routine nursing salary cost apportioned on a patient day basis.

COST

We estimate that the total cost of carrying out the proposed study plan would be about $8.3 million. Of this figure, about $4.7 million represents costs, including travel, of GAO personnel, 1/ and most of the remainder--about $3.6 million--represents estimated costs, including travel, of using professionally trained nursing personnel as observers. The following table summarizes our cost estimates.

Estimated Costs of GAO Study

	Contract costs	In-house costs	Total costs
Observer costs	$3,370,000		
Automatic data processing costs	200,000		
GAO personnel		$4,690,000	
Supplies (data collection)	15,000		
GAO support (training)		45,000	
	$3,585,000	$4,735,000	$8,320,000

The $3.6 million for contract costs represents costs not covered by our regular appropriation. 2/ As the Senate Finance Committee has recognized, the Congress will need to especially appropriate an amount to cover these requirements to enable us to conduct such a large and expensive study.

This estimate includes the costs of training and paying an extra 20 observers to be used in case some observers actually used prove to be unsuitable, become ill, or are unable to complete the study for some other reason. We estimate the additional costs of doing this to be about $220,000, or about 3 percent of the total costs of the study. We believe that the increased assurance of reliability for the results of the study offered by these additional observers more than offsets the relatively small increase in costs.

1/Represents about 160 GAO personnel full time for over 4 months.

2/These costs are based upon data available to us in August 1981. The amount required to be appropriated may differ depending on price and cost levels prevailing at the time the study is actually done.

CONCLUSIONS

We are reasonably confident that the study design described above would yield acceptably precise results about the existence and size of an aggregate Medicare routine nursing salary cost differential. However, there is no certainty that the sample of 90 hospitals will be large enough to yield results precise enough to be used to calculate hospital reimbursements for routine nursing services. Only an estimation of precision, which cannot be made until the first wave of data collection is complete, will help determine the sample size needed to achieve the desired precision.

In addition, it is doubtful that we would have enough hospitals to enable us to develop any reliable conclusions about the existence of a routine nursing cost differential among the four strata shown on page 24. It is also doubtful that we would be able to conclusively discuss the influence of other variables, such as geographic location and patient length of stay, on hospital routine nursing salary costs, although we do anticipate that the information developed would provide insights into possible causes of differences among hospitals in routine nursing costs.

Furthermore, existing studies, although seriously limited, suggest that the routine nursing differential for patients 65 and over varies widely from hospital to hospital. Not only does this increase the risk that statistical confidence may require a larger sample of hospitals than that now contemplated, but if true, it also reduces the meaning of the estimation of the aggregate Medicare routine nursing salary cost differential which the proposed study is designed to provide. If the range of the routine nursing salary cost differential over hospitals is wide, any single, aggregate differential may work hardship on some institutions and bring windfall benefits to others.

If this is so, it would be impossible to design a single, equitable aggregate Medicare routine nursing cost differential. A number of differentials would be required, based on the hospital or patient characteristics that most influence variation in the differential. In turn, this would require a study sample large enough to determine the relevant hospital or patient characteristics. Our proposed study is not designed to do this. It merely tests to see how much, if at all, the cost of caring for all Medicare patients 65 years or older in routine nursing care areas differs from the costs of caring for all other patients in such areas. It will not answer the question of why these costs vary. We believe that a study which addresses this broader question would need to be substantially larger and more expensive than the study described.

Finally the proposed study would attempt to measure the difference between the costs of nursing care provided Medicare patients and the costs of such care provided all other patients. However, elderly patients conceivably may be provided with more (or less) nursing care than they actually need. We see no way to measure need. Therefore, our study, like all other studies, would contain the hidden assumption that the nursing care patients are provided is what they need. There is no proof that this is true, and the Congress should bear this in mind when using the results of the proposed study if it is carried out.

The existing studies provide no irrefutable evidence about the size, existence, or nonexistence of an overall Medicare routine nursing salary cost differential. We believe that the proposed study would provide such evidence, although, as pointed out above, we cannot be certain. Furthermore, our results would probably not be useful in explaining any variation among hospitals in any differential found.

Finally, the proposed study would require a special appropriation of nearly $4 million.

AGENCY AND PROVIDER ORGANIZATION COMMENTS AND OUR EVALUATION

HHS questioned whether the additional information to be gained by doing our proposed study justifies its cost because

- --the proposed study may be no more reliable than previous studies because variance among hospitals may be too great,
- --hospitals may attempt to bias the study by altering nursing activities during the study period, and
- --the study will not address the question of distinctions between hospitals based on hospital or patient characteristics.

We agree that there is a possibility that wide variance among hospitals might impair the precision and usability of the results of our proposed study, and have discussed these possibilities at some length (see pp. 22 and 29). We also agree that our study is unlikely to enable us to discuss conclusively the influence of hospital or patient characteristics on the differential (see p. 29). However, we do not believe that hospitals would be able to significantly bias the results of the study by altering nursing activities. We do not believe that nurses would be willing to accept instructions to do so, and, in any case, we believe it would be difficult for nursing personnel to maintain changes in work patterns over the

entire 2-week study period. Any significant changes in patterns during the study period should be disclosed by the data collected, and tainted data would be discarded.

HFMA raised the question of how observations not assignable to a specific patient (code 3 in our scheme) will be allocated between aged and nonaged patients. Basically, these observations can be allocated in two ways: (1) based on the ratio of patient days and (2) based on the ratio of directly assignable observations. We contemplate presenting figures for both allocation methods and the pros and cons of each method.

HFMA also asked how missed observations (codes 4 and 5) would be used under the proposed methodology. Such observations would not be used.

ANA commented that the existing studies related to the existence of a differential do not adequately address the issue of the quality of routine care received by Medicare patients and believes any new study should address quality of care. ANA is concerned that attempts to reduce costs can lead to substitution of less qualified staff for providing routine nursing care and that this would adversely affect quality of care. ANA did not propose a methodology to address the quality of care issue. Our proposed methodology will measure the training levels of the staff providing care by differentiating observations by type of nursing staff. We do not know of any method we could incorporate in the proposed study methodology which would objectively measure quality of care. However, the methodology would measure the hours of care received by patients and, thus, would address the quality of care issue to the extent that hours of care reflect quality of care.

FAH commented that it believed our proposed stratification and sample selection procedures would result in an underrepresentation of hospitals with small amounts of routine nursing service costs and, therefore, would not yield results on which reliable national estimates could be based. Our proposed sampling plan is designed to give weight to hospitals where the payment of a differential would have the largest monetary effect. As discussed in this chapter, we would not expect to be able to make distinctions about the existence or size of a differential among hospitals by hospital characteristics such as hospital size. The sampling plan is designed to study the differential issue on an aggregate basis, and to enable us to make distinctions among hospitals would probably require a much larger sample and entail much higher study costs. In our initial planning in 1980 of the proposed methodology, we had suggested an unstratified random sample. At that time, HHS, AHA, and HFMA suggested a stratified random sample giving weight to hospitals with high amounts of

routine nursing service costs, and we accepted their recommendation. HFMA in commenting on this report said that the revised sampling plan was superior to our earlier proposal and would help assure that the results are representative of all acute-care institutions.

FAH also suggested that we include or substitute random observation of patients instead of random observation of routine nursing personnel. We considered this procedure in our initial planning but rejected it for two reasons. First, observing patients would only provide observations of the direct nursing care provided in the patient's presence; indirect care and time spent on general duties would not be observed. Second, the length of study time would have to be substantially increased in order to obtain enough observations to be statistically precise about the average amount of direct care provided because most of the observations would probably be that no care was being given at the time of observation.

CHA commented that apparently there was an absence of desire on our part to go forward with the proposed methodology. CHA indicates that our discussion of the proposed study's possible limitations gives the impression that it is not worth doing. We believe it is important to describe before the fact the possible limitations of the proposed study and that usable results cannot be assured so that the Congress will be aware of these circumstances when it considers whether to fund the study.

In summary, HHS questions whether conducting the proposed study is justified, while AHA, CHA, HFMA, FAH, and ANA support conducting it.

ROUTINE NURSING DIFFERENTIAL STUDIES

THE 1966 AHA STUDY

In 1966, in an effort to establish support for the existence of a Medicare routine nursing salary cost differential, AHA conducted a work-sampling study at 55 member hospitals. AHA initially decided to make the study in six hospitals in each of nine areas in the Nation. In addition, the sample hospitals were stratified by bed size. Furthermore, to reduce costs and permit study in each area to be supervised by a single coordinator, the six hospitals were located in a single metropolitan area. Fourteen hospitals initially selected declined to take part in the study. Substitutes were found to bring the number of hospitals up to six in all but two regions. In addition, in three regions, administrators of hospitals not initially in the study asked to participate. In these areas, seven hospitals participated.

Observations were made by hospital personnel, and in most hospitals, only one observer was used for each of the three shifts. Thus, in large hospitals, not all of the routine nursing care units could be included in the study. For such cases, the units selected for study were close together to minimize observer travel time. Each hospital conducted the study for 7 to 12 days.

Work-sampling observations were made on all nursing staff assigned to units under study. Nursing personnel assigned to specialized units within the hospital and special duty nurses assigned to a single patient were not observed. The order of observing units and personnel within units was randomized.

Analysts voided all data for one hospital and all data for one or two shifts for four hospitals. In a few other cases, there were discontinuities in hospital data because of inability to cover a shift due to observer illness, etc.

The study reported that, when patients were grouped by age, there was relatively little difference in hours of routine nursing care provided up to age 55. Above that age, hours increased, and they increased sharply for the age 75 and over group. For all hospitals combined, the hours of care provided those 65 and over exceeded all routine medical/surgical patients by 8 to 13 percent. 1/ However, the range in individual hospitals was from -2 to 34 percent.

1/These figures vary depending on whether observations not assignable to any patient are allocated in the same proportion as patient age mix or assigned observations.

The study estimated, for the 50 hospitals with complete data, the increase in nursing hours and the amount of increased nursing costs using two methods which varied in the method used to assign the portion of observations that could not be associated with a particular patient--that is, observations of idle time, time spent in general meetings and training, etc. First, when such observations were assigned based on the ratio of aged patient days to total patient days, nursing hours for the aged were 8 percent higher--the additional cost of this differential was $956,000. Second, when such observations were assigned based on the ratio of observations associated with caring for aged patients to observations associated with caring for all patients, nursing hours for the aged were 13 percent higher--the additional cost of this differential was $1.4 million.

GAO analysis

This study was a primary basis of the argument for the Medicare routine nursing salary cost differential; however, because of its several limitations, we believe it should not be considered as conclusive proof of the existence of such a differential.

The first of these limitations is its age. In 1966, when the study was done, Medicare was in its first 6 months of operation. Many elderly patients who came into hospitals in the years immediately after Medicare showed evidence of longstanding neglect of medical conditions. Elderly patients now entering hospitals have had the benefit of 15 years of Medicare-reimbursed care and may not be in such poor condition. In addition, the practice of hospital medicine has changed markedly since 1966. Specialized units for caring for very sick patients, such as intensive care units and cardiac care units, have proliferated and are now a part of most hospitals. Thus, very sick, elderly patients, who were once cared for in the routine medical and surgical nursing units, are now often cared for in these special care units, which are reimbursed as cost centers independent of the routine nursing salary cost center.

Furthermore, the following methodological problems impair the study's reliability as a predictor of industrywide behavior:

--The hospitals were not selected randomly.

--Where all routine nursing units in a hospital could not be observed, those that were observed were not selected randomly.

--The study was made during a period, spanning the Thanksgiving and Christmas holiday periods, when patient case mix is probably not representative of the yearly caseload.

--Observers consisted of hospital personnel, a possible source of bias.

Finally, while the study found an aggregate nursing differential in hours of nursing care of from 8 to 13 percent and, using wage data, computed an annual aggregate cost differential to the 50 hospitals with complete data of as much as $1,400,000, the study did not express this aggregate cost differential as a percentage of total routine nursing salary costs. We cannot tell from the information given whether this cost differential was greater or less than 8-1/2 percent of total routine nursing salary costs.

THE LEVINE AND PHILLIP STUDY

In February 1975, Harry D. Levine and P. Joseph Phillip of AHA published a study entitled "Factors Affecting Staffing Levels and Patterns of Nursing Personnel" conducted under contract from the Public Health Service. The study was done to determine factors affecting nursing staffing patterns to help hospital administrators optimize nursing department staffing.

This study used standard statistical techniques on data from four sources:

--A survey of nursing personnel employed in hospitals, conducted jointly by HHS' Bureau of Health Resources and AHA, 1970.

--Annual survey of hospitals, AHA, 1970.

--"Health Resources Statistics," 1971, HHS.

--"Census of Population, 1970," U.S. Bureau of the Census.

After data from these four sources were merged, 3,800 short-term general hospitals in the continental United States registered with AHA remained for analysis. These were divided into three groups based on teaching affiliation and type of ownership: nonprofit teaching hospitals, nonprofit nonteaching hospitals, and for-profit hospitals.

Within each of these three groups, the authors attempted to predict staffing hours for each of six different types of nursing personnel; for example, total nursing hours, RN hours, and LPN hours. Independent variables tested for predictive power included adjusted patient days, number of high-technology facilities, bassinets per statistical bed, percent of families below poverty level, and percent of population 65 years and over. For example, the variables found to best predict hours per adjusted patient day for aides, orderlies, and attendants in nonprofit, nonteaching

hospitals were (1) total admissions, (2) occupancy, (3) length of stay, (4) adjusted patient days, (5) percent of population 65 and over in the county where the hospital was located, (6) number of RNs per 100,000 population in the State, (7) number of LPNs per 100,000 State population, (8) number of aides, orderlies, and attendants per 100,000 State population, and (9) percent of families below poverty level in the county.

Among the variables tested for influence on nursing staff hours were the percent of population under 18 and the percent of population 65 and over in the county where each hospital was located. The effect of these two variables was large enough to appear in 6 of the 18 models. 1/ In five of the six models where the percent 65 and over appeared, it had a negative regression coefficient, meaning that an increase in the variable was associated with a decrease in nursing hours per adjusted patient day. The study stated in connection with the results of these two age-related variables that:

> "One may hypothesize that patients belonging to the excluded age category--18-64--generally come to the hospital with more serious ailments demanding closer attention by the nursing staff."

GAO analysis

For purposes of determining the existence and amount of a Medicare routine nursing salary cost differential, this study has several problems. First, the study's conclusion regarding the effect of age on nursing hours is seriously weakened by the fact that it used county population data, rather than the ratio of hospital patient days for those under 18 or 65 and older. The age proportion of a hospital patient mix is not systematically related to the age proportion of the county in which that hospital is located. Utilization data show that the elderly use more

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1/ The six models in which percent of population 65 and over was significant were:

--In nonprofit nonteaching hospitals, the models for (1) aides', orderlies', and attendants' hours, (2) general duty nurses' hours, and (3) general duty and head nurses' hours.

--In nonprofit teaching hospitals, the models for (1) total nursing hours, (2) general duty nurses' hours, and (3) general duty and head nurses' hours.

Age was never significant in staffing predictions of for-profit hospitals. Furthermore, age was never significant in any model predicting RN hours or LPN hours.

hospital days and have higher admission rates than younger persons. Furthermore, hospitals may draw patients from a wider area than the county in which they are located. Patient age-mix may also be affected by the preferences of local physicians and the presence or absence of specialized facilities in the hospital.

A second problem is that the study is not limited to medical/surgical routine nursing hours. This makes the results inapplicable to examining a differential limited to such hours.

In addition, the authors' primary concern was predicting staffing levels. They were not concerned with the causal relationships between possible independent variables and the dependent variable, nursing staff hours per patient day. Variables in the final model are those with the highest degree of correlation with nursing hours; however, correlation does not mean causation.

Furthermore, in the equations where percent of population 65 and over was retained as an independent variable, there are high degrees of correlation among other included variables--usually between total admissions and adjusted patient days. Such high correlation, or collinearity, among independent variables biases the effects of other independent variables and may distort relationships of causal significance. When the independent variables are related to such a large extent, a major assumption of regression analysis is violated, and the results are unstable.

Finally, the major dependent variable used was total nursing hours per adjusted patient day. This is not fully satisfactory because the crucial factor in the Medicare routine nursing salary cost differential is not nursing hours but nursing costs. For example, elderly patients may use more hours of relatively more costly nursing staff (such as RNs and LPNs) and less of the relatively less expensive staff (such as nurses' aides and orderlies), leading to a nursing differential in terms of costs but not of hours. The opposite could also be true. We believe that, although this study does suggest the absence of a nursing differential, it has too many limitations to permit any stronger conclusion.

THE NEW JERSEY STUDY

In 1976, the New Jersey Department of Health under contract with HCFA undertook the development of a reimbursement methodology based on diagnosis related groups (DRGs) rather than the traditional patient day.

To develop this methodology, New Jersey conducted two studies during the last half of 1977. The first of these, the Patient Classification System Acuity Instrument Nursing Pilot Study, was conducted in three short-term acute-care New Jersey hospitals. In this study, nursing personnel recorded the minutes spent for each occurrence of direct care on each shift for every patient for his/her entire length of stay during the last quarter of 1977. Each occurrence of direct nursing care was assigned to one of five general nursing categories that cover all aspects of direct nursing patient care. In addition, from hospital records the study collected data on patient diagnoses, surgical procedures, and age. These data provided a record of reported actual time for nursing activity in five different dimensions of nursing care relating to 3,497 patients.

The second study, the Joint Nursing Performance Analysis Pilot Study, was conducted in two New Jersey hospitals over a 90-day period and collected data from 1,200 patients in 13 nursing units. It was conducted primarily to cross-validate the nursing intensity measures derived from the first study--that is, the times observed for direct nursing activity--as well as to develop a means to distribute indirect time. This work-sampling time-and-motion study developed time values for constant routine activities and 109 variable nursing tasks. The study also collected data on diagnosis, procedures, length of stay, and age, enabling it to measure nursing activity in terms of total time while controlling for case mix.

Using the data developed from these two studies, which related minutes of nursing care and diagnostic characteristics, the study grouped patients into DRGs and consolidated these DRGs into major diagnostic categories. For each of the 83 categories, the study applied econometric analysis to predict nursing intensity as a function of length of stay, age, and presence or absence of surgery.

The study reported that, within major diagnostic categories, age was negatively related to nursing intensity. In other words, the greater the age, the lower the consumption of nursing resources. As one critic pointed out, this finding, even if correct, does not necessarily mean that there is no nursing differential. If Medicare patients dominate the nursing-intensive categories, then a Medicare routine nursing salary cost differential may well exist.

To permit the identification of a nursing salary cost differential across DRGs, the study performed a cost simulation with a data file on 217,476 inpatients in 18 New Jersey acute-care hospitals for 1977. With the equations relating nursing intensity to certain patient characteristics, the authors derived an average cost per DRG by generating estimates of nursing intensity for all patients in a particular DRG, calculating an average intensity in minutes

per DRG, determining the ratio of this average intensity to the total nursing intensity of the hospital, and applying this ratio to the total nursing costs of the hospital. Using this average cost per DRG, the authors computed the relative costs of elderly and nonelderly patients in a reimbursement system based on DRG-specific rates rather than an average cost per patient day.

When the results were weighted for number of 65 and over patients within a DRG, patients 65 and over consumed only 97 percent of the average nursing salary costs consumed by all groups. The study's authors concluded that, if their DRG-based method of reimbursement were adopted, hospitals would be reimbursed for patients 65 and over at the rate of 97 percent of average nursing salary costs.

GAO analysis

This study includes data from patients in intensive care type units, which are reimbursed by Medicare separately from routine units, thus introducing a possible bias into the results for our purposes. However, it is not clear in what direction this bias might work. For example, if Medicare patients are relatively more heavily represented in intensive care units, this would tend to overestimate their nursing costs for our purposes because nursing costs per patient are higher in such units than in routine nursing units.

The study attempted to select hospitals reasonably representative of New Jersey acute-care hospitals. The selection, however, was nonrandom, and the sample size makes it difficult to extend the results beyond the hospitals themselves, much less to hospitals outside the State with statistical validity. However, the authors felt the cross-section of services and case mix in the sample was representative of New Jersey hospitals as a whole.

This study was intended as part of an effort to create for New Jersey a new hospital reimbursement system based on patient diagnosis rather than on the traditional patient day, and its results were not final. The study is continuing, and a later, more sophisticated version is to be used as the basis for the reimbursement system. We do not believe that the preliminary study is precise enough to offer more than a strong suggestion that in New Jersey there is no routine nursing salary cost differential for Medicare patients.

THE CASH STUDY

In April 1980, the Commission for Administrative Services in Hospitals, a nonprofit California corporation designed to serve client hospitals by obtaining information pertaining to the more efficient and economical operation of hospitals, issued a study

entitled "Examining the Influence of Medicare Aged Patients on Hospitals' Consumption of Nursing Staff Hours on Medical/Surgical Nursing Units." CASH used a preexisting file of 125 hospitals, about 25 percent of all California short-term acute-care hospitals. This file contained a partial year's information related to

--total medical/surgical nursing hours consumed,

--total medical/surgical patient days served, and

--ratio of Medicare aged patient days served to total patient days served.

The study grouped these 125 hospitals into five cells based on their proportion of Medicare aged patient days served. It then established the median of the average nursing hours per patient day served for all hospitals in each cell. With this information, the authors performed simple bivariate regression analysis to determine what effect a change in the proportion of Medicare aged patient days had on nursing hours per patient day.

The study found that, for each 1-percent increase in the Medicare aged patient day ratio, nursing resources provided all patients are increased 0.29 percent. The study concluded

> "Assuming other staffing factors to be equal, our findings indicate that Medicare aged patients are provided 29 percent more nursing resources per patient day than are patients under Medicare age."

GAO analysis

We believe that this study contains several limitations which seriously restrict the reliability of its findings. First, there is no evidence in the study that the hospitals were randomly selected or representative of California hospitals. Furthermore, the study was not clear on the information this file contained. For example, the study did not clearly state that the information was restricted to routine medical/surgical hours and patient days.

Second, this study, like several others, measured the change in nursing hours against the change in the ratio of Medicare patient days to other patient days. However, the question at issue involves costs, not hours of care.

Third, the 0.29-percent increase in nursing resources associated with a 1-percent increase in the Medicare aged patient day ratio was derived from predictions based on a simple bivariate regression line. This line estimates the amount of nursing resources consumed over a range of Medicare patient day ratios. The estimate contains some error, as does any prediction based on regression analysis. The authors were unclear about the size of

this error. There is no indication of how well the regression line fit the data analyzed. Without knowledge of the goodness of fit, simple calculations based on the regression predictions cannot be accepted because the confidence interval is not known. When we asked about the confidence limits of this regression, a CASH official told us that this study was not intended as statistical proof of the existence of a nursing care differential for Medicare patients.

Finally, the study ignored the existence of other variables that may produce variations in hospital nursing resource consumptions. Other studies (HCFA and Levine and Phillip) suggest that other variables may have a stronger effect on nursing resource consumption than does age mix of patients. Part of the effect attributed by this study to age variation may be due to these other variables. The influence of excluded variables, such as case mix, length of stay, and hospital size, interacts with the influence of the included variable, Medicare patient day ratio, which biases the regression results and further weakens any calculations based on these results. For these reasons, we believe that this study supplies only weak support for the existence of a Medicare routine nursing salary cost differential.

THE HCFA STUDY

In October 1981, HCFA's Office of Research, Demonstrations and Statistics issued "A Statistical Analysis of the Medicare Hospital Routine Nursing Salary Cost Differential" (dated Aug. 31, 1981) by Dr. J. Michael Fitzmaurice, Chief of the Institutional Studies Branch.

This study was based on the Medicare cost report data for 1979 merged with the AHA Annual Survey of Hospitals for 1979 and the 1978 Medicare case mix index. After combining the three data sources 4,521 hospital observations remained because of incomplete cost reports, inability to match hospitals in all three sources, and missing data for crucial variables. The author noted, however, that there are about 5,850 short-term, community hospitals in the United States. Most of the cost reports were unsettled.

The study also used a 1,200-hospital sample of Medicare cost reports for 1977, 1978, and 1979. This sample, like the 1979 file described above, was chosen from the file of Medicare hospital cost report data and was stratified into four groups by bed size. This sample was heavily weighted toward hospitals in the larger bed-size categories.

The study examined the relationship between per diem hospital routine nursing salary costs and the proportion of qualifying Medicare routine patient days to find out if hospitals with more qualifying Medicare days have higher per diem routine nursing

salary costs. To isolate this relationship, the study used statistical analysis designed to hold constant the influence on routine nursing salary costs of other factors, such as local area wages, occupancy rate, geographic region, and Medicare case mix.

The study reported that:

> "The proportion of hospital routine patient days consumed by Medicare patients was weakly associated with routine per diem hospital nursing salary costs. This association appeared to be positive but most often not statistically significant at conventional levels. The size of this association and its lack of consistent statistical significance does not support a Medicare routine nursing differential payment of 8-1/2 percent."

When observations were stratified into four bed-size groups, all significant positive relationships disappeared between proportion of Medicare routine days and per diem routine nursing salary costs. Several other variables, such as hospital occupancy rates, local area wage levels, and number of interns and residents per bed, appeared to exert far more influence on per diem hospital routine nursing salary costs than did the proportion of routine Medicare patient days.

GAO analysis

This study represents the most ambitious effort to ascertain the existence and size of a Medicare inpatient routine nursing salary cost differential to date. Its conclusion that there is little or no industrywide Medicare differential is an important addition to the information on this issue. However, this study too has some limitations.

This analysis explains only about 40 percent of the observed variation in routine nursing salary cost per day. This low percentage may mean that potentially important variables have been excluded from the analysis. On the other hand, the low proportion of explained variation may indicate a large amount of random fluctuation in routine nursing salary costs among hospitals. This fluctuation will prevent a differential that may exist for some individual hospitals from being detected on an industrywide basis.

Although having a larger proportion of explained variation would be preferable, this is not the only reason to perform regression analysis. Individual variables can be tested for their isolated effect while holding other factors constant and can be statistically significant despite a low proportion of explained variation. Certain variables hypothesized to affect routine nursing costs--such as regional location, occupancy rates, and local wage rates--did have a significant effect. Others--most

notably the proportion of routine Medicare patient days--did not significantly affect per diem routine nursing salary costs.

Another problem is that the primary file of this study--the 4,521 observations resulting from separate data source mergers--contained data from unsettled 1979 cost reports. This means that the hospital and intermediary have not yet agreed on the costs reported by the hospital. For some hospitals, the routine nursing salary costs, as well as other data elements in the reports, may be increased; for others, these elements may be decreased. Settled cost reports can differ significantly from unsettled reports. This difference can cause a change in the variation of variables in the cost report data (such as routine nursing salary cost) across all hospitals. In turn, this can cause a change in the estimated effects of one variable, such as proportion of routine Medicare patient days, on another, such as per diem routine nursing salary costs.

This study is the most relevant and complete attempt to detect an aggregate Medicare routine nursing salary cost differential to date. We believe that this study's failure to detect such a differential is strong, though not conclusive, evidence against its existence.

OTHER STUDIES

Other studies relating to the Medicare routine nursing salary cost differential exist, but because of design limitations, their results are generally not widely applicable. Some were for individual hospitals; others looked at care in several hospitals. Some were based on patient acuity classification systems; others used analysis of frequency distributions of tasks performed for particular patients as noted by personnel performing the tasks. None conclusively supported or refuted the routine nursing salary cost differential.

Acuity level studies

A patient classification acuity system is a tool designed to estimate staffing levels and distributions within a particular hospital. Each patient is assigned to a care class after examination by hospital nursing staff. A nurse on each unit estimates the degree of care each patient will need, according to certain indicators. Indicators in one study we examined include the need for

--assistance with bathing,

--a bedpan,

--a change of dressing, and

--intravenous fluids.

Based on the amount of care they were estimated to require from such an examination, patients were assigned to one of three or four care classes.

By analyzing the distribution of patients among classes and the associated estimated nursing hours, these systems enable hospital managers to better determine where to assign nursing personnel. While such a system may be accurate enough for determining staffing needs, it is not, for reasons discussed below, a generally reliable means of examining the Medicare differential.

Studies by the Hospital Corporation of America (HCA), the Massachusetts Hospital Association, and the Illinois Masonic Medical Center all used some form of patient acuity classification system to investigate the nursing differential. After summarizing these three studies, we will discuss general problems encountered with applying such acuity systems to the differential question, as well as problems specific to each study.

HCA studied 11 member hospitals in six States and found that a differential existed based on the distribution of patients into various care levels. A patient in a higher care level required more nursing hours: Class I required the least care, Class IV the most. HCA compared the percentage of the group of 65 years and over, 14 and under, and obstetrics patients in each of the four care classes to the percentage of the 15 to 64 year group in the same classes.

In all 11 hospitals, the 15 to 64 year group had a lower proportion of Class III patient days and a higher proportion of Class I patient days when compared to the 65 and over group (the number of Class IV patient days was insignificant). Because more patients in the 15 to 64 group were in a lower care category, as a group they were found to get less care than the older group. Hence, the study reported that a nursing differential existed for the 11 hospitals as a whole, although HCA did not attempt to quantify it.

A September 1979 study by the Illinois Masonic Medical Center in Chicago used the center's patient acuity classification system to examine the nursing differential for Medicare patients in medical, surgical, psychiatric, and intensive care units. Like the HCA study, this study found that a higher proportion of Medicare days were spent in the highest care class. While only 11 percent of the non-Medicare patient days were in the highest class, 27 percent of the Medicare patient days were spent there.

A Massachusetts Hospital Association single hospital study used a patient acuity system to allocate care hours in preparing budget data for its 1982 fiscal year. The study found that patients over 65 years used an average of 6.3 care hours per patient day, while patients under 65 used only 5.0 hours.

The major problem is that these studies use patient acuity classification systems. Although such a system may be valuable in planning nursing staff levels, there is no evidence that this system is sufficiently sensitive to be considered a reliable methodology for determining the existence of a Medicare routine nursing salary cost differential. Since different hospitals may use different acuity classification systems, and since the same system may be applied differently in different hospitals, use of acuity systems is clearly not suited to examining an industrywide Medicare differential.

At the single hospital level, two problems prevent such acuity systems from being an accurate reflection of patient care costs. First, the amount of care delivered within an acuity class varies from patient to patient; each does not receive the same amount of attention. Such acuity systems are not designed to give a record of actual care received, but rather to estimate the average amount of care per patient class for determining staffing levels.

Secondly, these acuity systems look only at hours of care and do not address costs. The relative costs of care can vary between and within acuity classes based on the salary of the service provider. For example, the patient's ability to perform activities of daily living--such as eating, bathing, and dressing--is often an important factor in determining into which acuity class a patient (particularly an aged patient) is placed. However, assistance with these tasks may be provided by relatively lower paid aides and orderlies rather than RNs or LPNs. Because of variations in salary levels, the cost of care can vary within a category from patient to patient.

In conclusion, such patient acuity classification systems are designed to provide rough estimates for staffing purposes and should not be used to analyze the routine nursing salary cost differential. Such systems simply do not address the relevant question of actual care hours delivered and relative costs of those hours.

These three studies illustrate the problems with such acuity systems. None addressed the question of actual costs associated with each category, limiting the focus to average hours of care. Similarly, none examined the differences of care among patients within a care level or the relative costs of services for a particular patient in a particular care level.

Task frequency studies

Other studies used different variations on the industrial engineering techniques of time-motion study. Two studies, one by Ohio Hospital Management Services and one by Intermountain Health Care, Inc., used a methodology which focused on the frequency of tasks performed for patients as noted by the nursing

personnel performing the tasks. Standard task times were used to assign a time value to each patient based on the frequency of task performance.

Ohio Hospital Management Services found, using this task frequency methodology, that in 123 medical/surgical units in 22 Ohio hospitals surveyed at various times from 1977 to 1980, patients over 65 received an average of 18.5 percent more nursing care than all other patients. The range across hospitals was 1.6 to 42.6 percent, while 10 percent of the individual units within hospitals had a negative differential.

Intermountain Health Care surveyed medical, surgical, pediatric, and obstetric units in three hospitals in Utah in the spring of 1975 and one in the spring of 1976 using a similar frequency method. The incremental increase in nursing time for patients over 65 years ranged from 1.5 to 22.9 percent.

Each of these studies has two major limitations. Most importantly, each looked at hours of care per patient day rather than costs of care. If the elderly receive a larger proportion of care, but the care is in custodial services normally performed by lower paid personnel, there may be no differential in terms of average cost per patient hour.

In addition, neither of the studies was designed to provide statistically valid estimation of an industrywide Medicare differential. The Ohio Hospital Management Services study included only nonprofit facilities and consolidated data collected at different times between 1977 and 1980. Similarly, the Intermountain Health Care study looked only at four Utah hospitals, and it is not clear that observations were restricted to routine nursing units.

Miscellaneous studies

Lewin and Associates completed a study dealing with the nursing differential in September 1981. In this study, all nursing services personnel were asked to maintain logs of their activities over three shifts for 24-hour periods in 15 hospitals in three States. The study reported a differential in terms of nursing hours of between 10 and 14 percent, depending upon whether nursing time not assigned to a specific patient was allocated in proportion to direct nursing time, equally across patients, or a combination of the two.

The study report notes that it was designed to explore the usefulness of the methodology rather than to assess the existence of a nursing differential. Because of the small sample size, the manner in which data were gathered, and the fact that the differential is reported in terms of nursing hours rather than

costs, we do not believe that much weight can be placed on this study's reported differential.

Miller and Byrne observed 300 patients in five Connecticut hospitals over 520 hours each and found an average differential in costs of services of 9 percent across hospitals with a range from 3.3 to 13.2 percent. It is unclear from the study whether this is a differential between Medicare and all other patients, Medicare and private insurors, or Medicare and the total patient population. In addition, we have been unable to clarify the technique used to relate average minutes of care by payor to nursing service costs. In light of these problems, we can place little confidence in the results.

The Hospital Management Systems Society released in 1980 a compilation of several studies. An Oregon study measuring bedside nursing care in six hospitals supported a differential. In a Chicago-area teaching hospital, Medicare and Medicaid patients received only 95 percent of the nursing time that other patients received. Studies from a western multihospital system, two upper midwestern hospitals, and a multihospital system in Texas all supported a differential in care hours, but the amount of the differential varied considerably among units.

The society noted that the results of these studies cannot be compared because of the varying time periods over which data were collected, the different collection methods and data definitions, and the likelihood that different hospitals will have different care requirements for any group of patients. The society concluded:

> "If cost is to be the primary basis for determination of payment, a study should be funded that will provide reasons for the variability of nursing care required and a rational payment procedure."

We agree that none of these studies address the cost of care issue and reiterate that a differential in terms of hours of care does not necessarily mean a differential in terms of cost. In addition, several of these studies are based on patient acuity classification systems, and there is no evidence that such systems are a reliable tool for estimating a routine cost differential.

PROPOSED METHODOLOGY,

ROUTINE CARE DIFFERENTIAL STUDY

I. STUDY OBJECTIVES AND SCOPE

The primary objective of the proposed GAO study is to determine the difference in salary cost, if any, between providing routine nursing care to hospital inpatients 65 years of age and older (the aged) and providing such care to other patients (excluding nursery patients). The study is designed to meet this objective by providing the following computation.

$$\frac{\text{routine nursing salary cost per aged patient hour}}{\text{routine nursing salary cost per nonaged patient hour}}$$

To obtain this ratio, the study will use work-sampling techniques to estimate the number of nursing care hours provided to aged and all other patients in routine nursing units in 90 sample hospitals. The study will determine hours of care for aged and nonaged patients by the various categories of nursing care provider (registered nurse, orderly, etc.). These hours of care will then be multipled by the average salary cost for that provider for that hospital and summed across hospitals 1/ to obtain total salary cost for each age group. Each sum would be divided by total patient hours for the respective age group to determine the cost per patient hour of patient care.

In addition, the study will collect other data regarding the hospital, nursing staff, and patients receiving the care and will use this information to calculate ratios for various attributes, such as hospital type, patient diagnosis, and classification of nursing care provider. GAO will test these ratios for statistical significance, although the sample size would probably not allow us to develop any conclusions about the relationship between the differential and these other factors.

The study group in each hospital will be the staff and patients in routine nursing care units. For purposes of this study, "routine nursing care" is defined as care performed in nursing units not associated with the nursery or with services for which a separate charge is customarily made (e.g., therapy, laboratory procedures, and radiology). Hospital beds that are not Medicare certified will be excluded from the study, as will

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1/The data for each hospital will be weighted so that their influence on the final ratio will be proportional to the hospital's size relative to the universe.

staff and patients in intensive care type inpatient hospital units as defined in 42 CFR 405.430.

II. ANALYSIS PLAN

Data collection methodology

The methodology used will be a work-sampling study of the providers of nursing care (RNs, LPNs, nurses' aides, etc.) who perform nursing activities in nursing units not associated with the nursery or with services for which a separate charge is customarily made. Nursing personnel assigned to an intensive care unit, coronary care unit, or other intensive care type inpatient hospital unit will not be included. The study will be made on a unit-by-unit basis in each of the study hospitals. To the extent possible, the study will cover all units in the hospital that are included in the scope of the study, as described in section I of this appendix.

The work-sampling will consist of a random sequencing of observations of each member of the nursing staff according to a predetermined schedule of observation times. The schedule is arranged so that the same number of observations will be obtained during each 12-minute time period during the 14 days of the study. Details of the observation schedules and methodology are explained in sections VI and VII. The observer will record the classification of the staff member observed, if direct or indirect nursing care was, at that moment, provided to a specific patient and, if so, the patient's room and bed number, or if general activities not related to a specific patient were being performed. This information, coupled with the aged and other patient hours in each unit and the available staff hours and average hourly wage rates, will provide the data required to calculate the ratio of aged to other routine nursing care resources per patient hour.

Data analysis plan

The routine nursing care salary differential study is designed to develop a nationwide estimate of the ratio of staff wages per patient hour for patients 65 years of age and older to staff wages per patient hour for patients under 65. The estimated ratio is based on work-sampling measurements of nursing staff activities taken at a stratified random sample of 90 Medicare-certified hospitals. Within strata, each sample hospital contributes to the calculation of the overall ratio in proportion to its size as measured by the number of patients 65 years of age and older and the number of patients under 65. Each stratum's contribution to the calculation of the overall ratio is inversely proportional to the sampling fraction (number of hospitals sampled divided by the total number of hospitals) for that stratum.

The study will also develop ratios of staff wages per patient hour for patients 65 years of age and older to staff wages per patient hour for patients under 65 for various subcategories of the population (such as type of hospital, type of diagnosis, and sex of patient). It will also be possible to develop ratios for individual hospitals. But these must all be tested for statistical significance, and given the sample size and uncertainty of variance, we do not know which, if any, will have statistical meaning.

To make it easier to compute sampling errors and detect bias, each observed shift will be randomly assigned to 1 of 10 possible replicates; that is, interpenetrating subsamples. Ratios will be calculated separately for each replicate and then averaged to obtain one overall ratio. For detailed formulas describing this process, see appendix V.

The proposed study will consolidate data from three sources: hospitals, individual patients, and individual observations of nursing personnel. For hospitals, data elements include:

--Hospital ID number.

--Unit ID number.

--Shift ID number.

--Name.

--Location.

--Age.

--Type.

--Number of Medicare-certified beds.

--Number of Medicare-certified routine beds.

--Wage scale for staff types by day, unit, and shift.

--Available staff hours by type by day, unit, and shift.

--Average daily census by day and unit.

For individual patients, data elements include:

--Hospital ID.

--Unit ID.

--Shift ID.

--Day of survey.

--Room and bed number.

--Age.

--Medicare status.

--Total number of diagnoses.

--Primary diagnosis.

--Secondary diagnosis.

--Total number of procedures.

--Primary procedure.

--Admission date.

--Admission time.

--Discharge date.

--Discharge time.

Observation data will include:

--Hospital ID.

--Unit ID.

--Shift ID.

--Day of survey.

--Room and bed number.

--Staff type observed.

--Observation code (1-5).

These three groups of data will be compiled through common elements, such as hospital ID, unit ID, room and bed number, and day of survey. As a minimum the file used for initial analysis will contain the following:

--Hospital ID.

--Unit ID.

--Shift ID.

--Day of survey.

--Room and bed number.

--Staff type observed.

--Observation code.

--Age of care recipient.

--Wage scales for staff type by day, unit, and shift.

--Available staff hours by type, day, unit, and shift.

--Average daily census by day and unit.

--Total aged patient hours by day, unit, and shift.

--Total nonaged patient hours by day, unit, and shift.

From these data one can make the necessary computations to determine the weighted average staff wages per patient hour for aged and nonaged patients and form the ratio

$$\frac{\text{routine nursing salary cost per aged patient hour}}{\text{routine nursing salary cost per nonaged patient hour}}$$

All computations begin at the unit-shift level and are consolidated to derive the final ratio. For example, a particular hospital's contribution to the aggregate ratio starts with the division of staff observations by age of care recipient at the unit-shift level. Using the staff type designation for each observation and the wage level for each staff type, we can develop a staff wage per patient hour for each unit, shift, and day of the study. These unit-shift specific figures are summed for each hospital and over all hospitals after weighting to reflect the relative patient populations of each hospital within strata and each stratum's contribution to the aggregate ratio. For detailed formulas describing these computations, see appendix V.

III. OBTAINING AND RECORDING HOSPITAL INFORMATION

The data describing each of the study hospitals will be obtained from several sources, and a number of forms will be used. Each hospital will be assigned a three-digit ID number that must be included on all forms used in the study. The ID number will be furnished to the staff at each hospital.

The basic hospital data will be obtained as a printout of the HCFA data. This information will be furnished to each site supervisor for verification with the hospital administration. As a minimum the following data will be included:

--Hospital name.

--Location (city, State, region).

--Provider number.

--Type of hospital.

--Special services provided.

--Number of certified beds.

The hospital ID number should be written on the printout along with any changes in the data. Additional information must be obtained from the hospital administration as shown in Form HS-1, page 70.

Before beginning the survey, GAO should obtain information on the routine nursing care units in the hospital to be used for planning and recording purposes. Each unit within a hospital should be assigned a unique code number. Form HS-2, shown on page 71, should be used to record unit information.

The GAO site senior will plan the study using the nursing unit data. If possible, all units will be surveyed for the full 2 weeks. If this cannot be done, the units will be randomly selected for study. If there is more than one unit of the same type and if patients are assigned to these units based only on space available, GAO may choose to survey only one of the units, or to survey 1 week in each unit. All decisions to survey less than the full number of nursing units, or to survey less than the full 2-week period in any one unit, must be referred to headquarters staff for approval before observations are begun.

IV. OBTAINING AND RECORDING PATIENT INFORMATION

Patient data will be recorded daily for all patients in each eligible unit in the hospital. None of this data will be identifiable by patient. Form HS-3, shown on page 72, will be used for this purpose. The form will be prepared on a unit-by-unit basis on the first day of the survey for all existing patients, and will be updated daily with all new admissions and discharges by the supervisor. Patient moves to other units will be considered a discharge from one unit and admission to another unit for all purposes except length of stay in the hospital.

Patient data concerning diagnoses and procedures may not be available during the survey and will be obtained later. Suitable arrangements will be made with each hospital to allow for collection of the following data.

--Primary diagnosis code number.

--Secondary diagnosis code number.

--Total number of diagnoses.

--Primary procedure code number.

--Total number of procedures.

V. OBTAINING AND RECORDING NURSING STAFF INFORMATION

Form HS-6, shown on page 75, is to be used for reporting nursing staff hours. The information described, as follows, will be collected from available hospital records and/or the Unit Staff Roster.

--Hospital ID.

--Unit ID.

--Number of days the unit was sampled.

--Lowest and highest room numbers in the unit.

--Date (Julian).

--Number of hours, by shift, for each staff title as follows:

-RN.

-LPN/LVN.

-Nurse technician.

-Aide.

-Orderly.

-Graduate nurse.

-Ward/Unit clerk.

-Other (must be providers of nursing care as described on page 48).

--The number of observation rounds made on the shift.

Form HS-6 provides for data recording for all three shifts for the entire 14-day data collection period.

VI. OBSERVER ASSIGNMENT AND SCHEDULING

This section describes the methodology for assigning nursing units to the observers and developing observer schedules. The following four steps are required to prepare the schedule and Observation Data Sheets for the observer.

Step 1 - Determine the number of observers required.

Step 2 - Assign the units to the observers and randomize the observation sequence.

Step 3 - Select the Master Schedule for each shift and randomize the daily schedule.

Step 4 - Prepare the observation data sheets for each observer.

Steps 2, 3, and 4 will be performed by the shift supervisors. We will accomplish step 1 before starting the survey. The site senior will verify the information we used in step 1 before beginning work at a hospital. Differences that affect observer staffing should be reported to us so that staffing adjustments can be initiated with the contract agency.

Step 1 - Determine the number of observers required

Total the number of staff members on each shift and post the total at the bottom of each column on Form HS-2, divide the totals by 35, and round the value to the next highest number. At least one observer is required on each shift.

Step 2 - Assign the units to the observers and randomize the observation sequence

Assign the units for each shift to the observers by dividing the staff as evenly as possible among the observers, and considering the location of the units.

Randomize the observation sequence of the units covered by each observer by writing the unit numbers on a deck of 3 x 5 cards and shuffling the deck upside down. The sequence of units, when the deck is turned face-up, is the sequence that will be used on the first day. The sequence will remain fixed throughout the week except that the first unit observed each day will be randomly selected.

Prepare Form HS-5, page 74, which is a 3 x 5 card, for each observer. Post the observer's name, the observation sequence for the units, the first unit to be surveyed each day, the estimated number of staff members in the units, and the observation frequency as explained below.

The basic observation frequency, as shown on the Observation Form HS-7, page 76, is every 2 minutes. With scheduled breaks, this frequency will result in 2,550 observations per observer during the 14-day study, or about 183 observations per day. Where an observer has only a few people to observe, the frequency should be reduced according to the following table:

Staff	Frequency (minutes)	Average Obs/Staff-Hour
6 or more	2	
5	4	2.3
4	4	2.8
3	4	3.8
2	* 6	3.8
1	* 12	3.9

*Observation starting time will be further randomized if these figures are used.

Step 3 - Select the master schedule for each staff and randomize the daily schedule

Exhibits 1, 2, and 3, on pages 58, 59, and 60, show 14 daily schedules for early, normal, and late meal breaks. The supervisor should select the schedule that best fits the food service schedule on each shift.

These schedules have been designed so that there are four 12-minute breaks during each of the 14 days of the study in addition to a meal break. Accordingly, once a schedule is selected for a nursing unit, or a group of units, it must be used for the entire 14-day study period.

After the master schedule is chosen, the daily schedules should be assigned randomly to the survey days. This can be done by preparing a deck of 3 x 5 cards numbered 1-14. The cards should be shuffled face down and turned over. The schedule number on the first card should be used on the first day, the schedule number on the second card the second day, etc. The day number should be written next to the schedule number on the schedule sheet.

Step 4 - Prepare the observation sheets for each observer

The Observation Data Sheets, Form HS-7, page 76, are pre-printed with the observation time in 2-minute intervals. There are 24 different forms with 1 hour on each form.

The supervisors should select 14 sets of forms that cover their shift for each observer, and complete the headings on the forms with the appropriate information. Then the supervisor should mark out the break periods for each day on each set of the forms. The marked forms should look like the example shown in exhibit 4, page 62.

VII. RECORDING OBSERVATIONS AND MONITORING THE DATA COLLECTION EFFORT

RECEIVING ASSIGNMENTS

Members of the observation team will report to the site supervisor 45 minutes before the shift starting time. Upon reporting, the shift supervisor will (1) give each person his or her assignment for the shift and (2) discuss any discrepancies noted for the previous day's observations. This assignment will consist of a set of the following three types of forms.

Schedule for EARLY MEAL BREAK

Shown in 12-Minute Intervals for 8½ Hour Day
X = Break Periods

Shift Hours

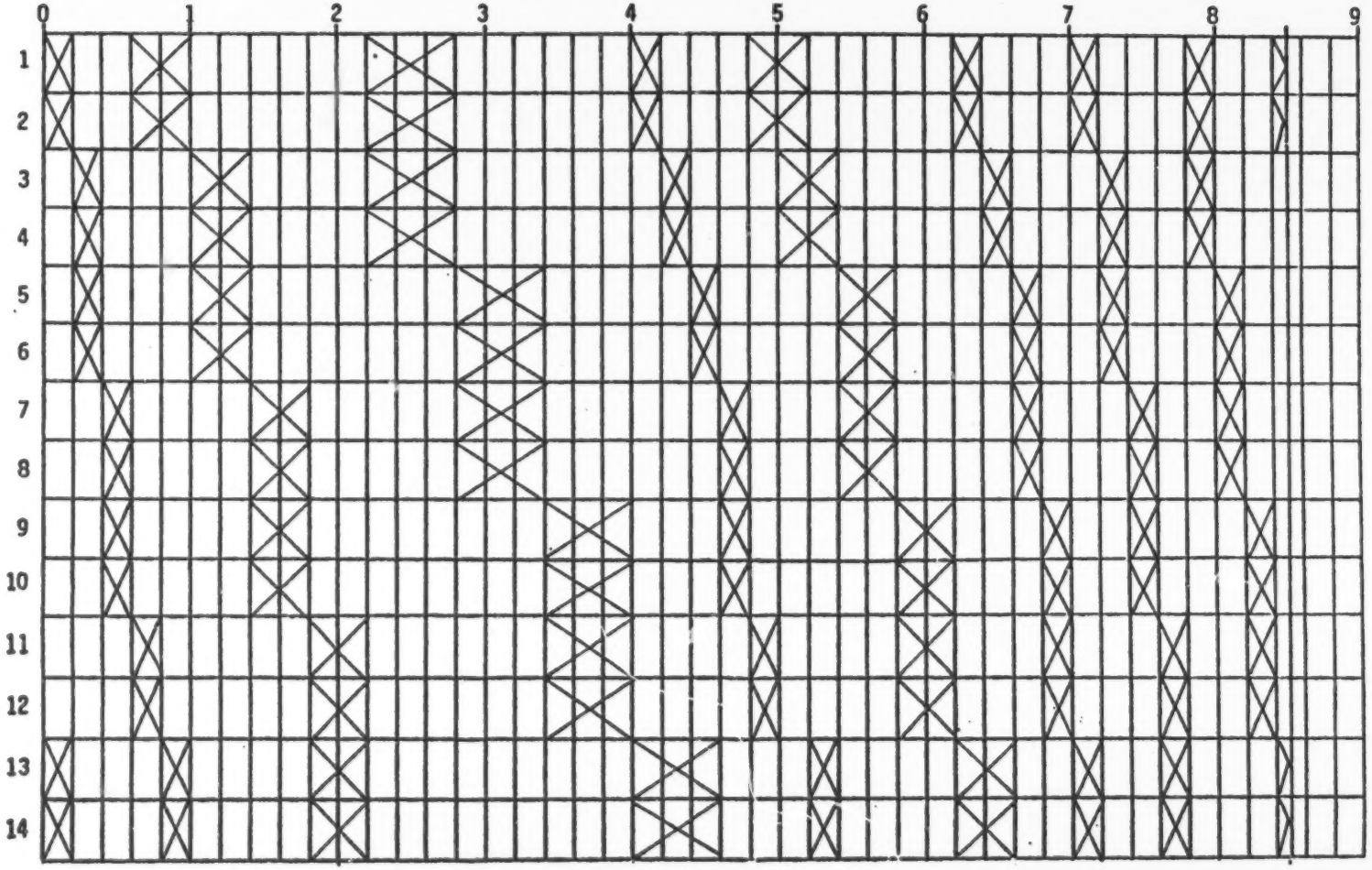


Exhibit 1

APPENDIX II

SCHEDULE FOR NORMAL MEAL BREAK

Shown in 12-Minute Intervals for 8½ Hour Day
X = Break Periods

Shift Hours

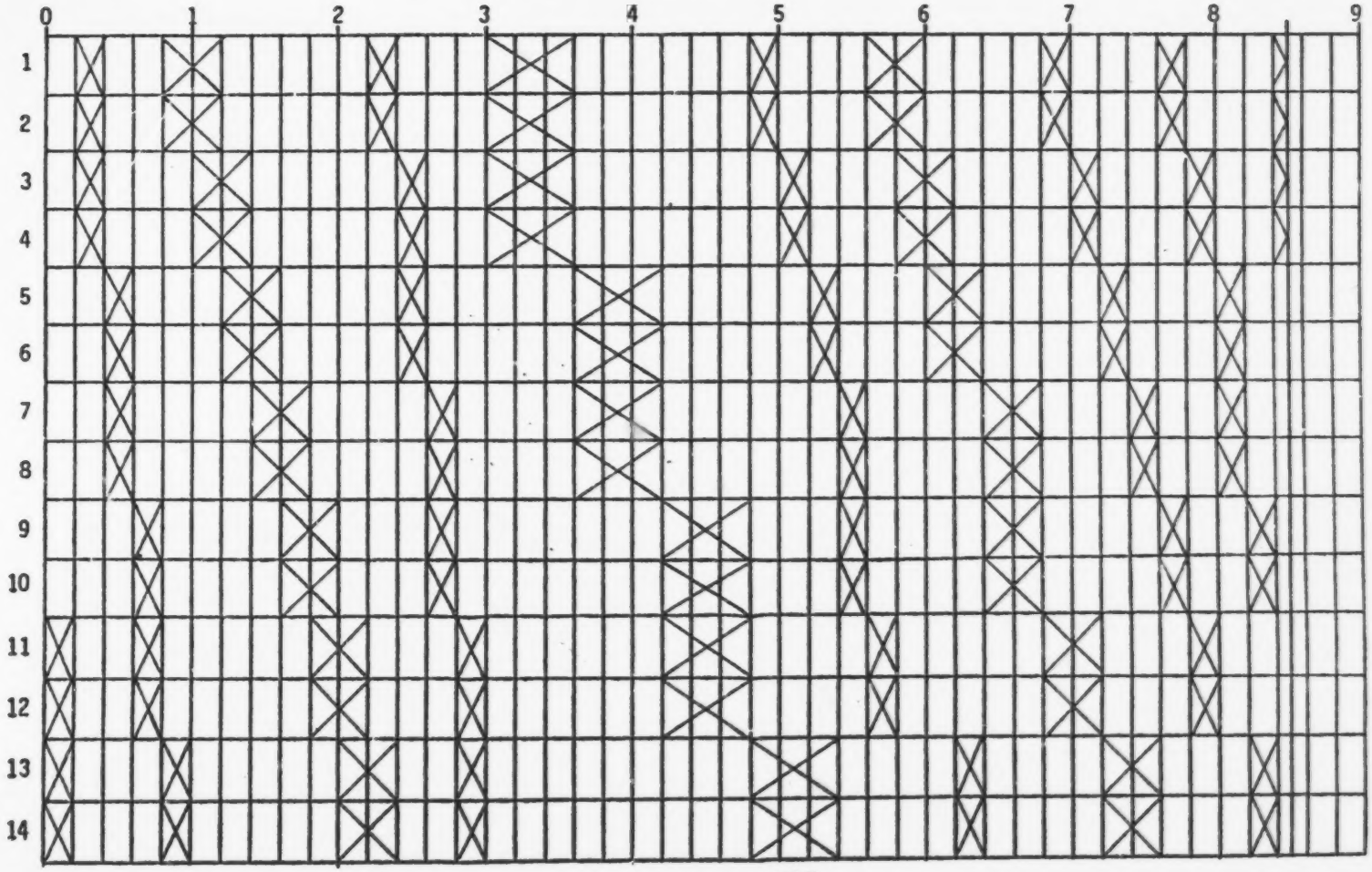


Exhibit 2

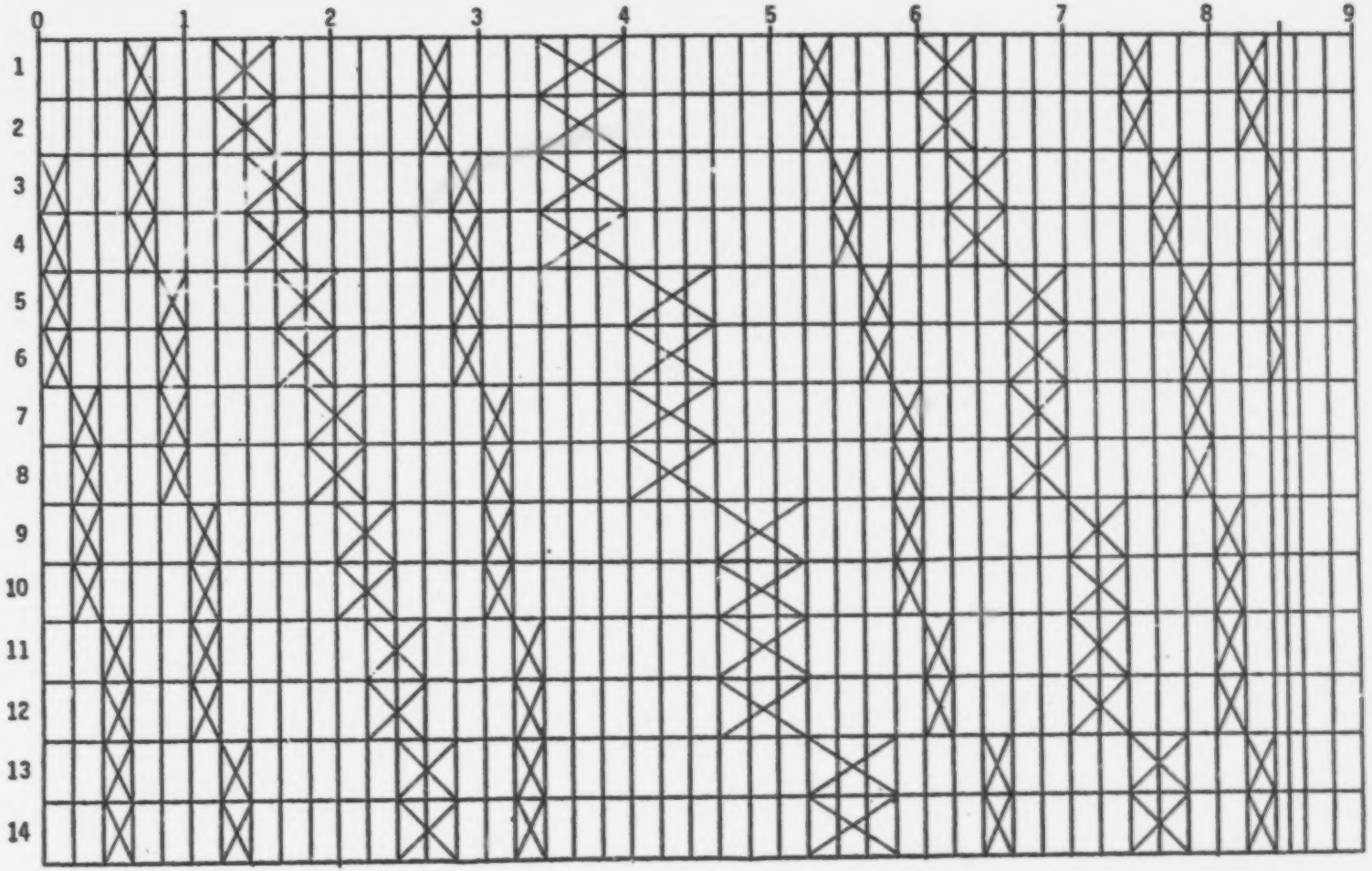
APPENDIX II

Exhibit 3

Schedule for LATE MEAL BREAK

Shown in 12-Minute Intervals for 8½ Hour Day
X = Break Periods

Shift Hours



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Round Check-off Sheet (Form HS-4, p. 63):

Observers will receive one Round Check-off Sheet for each unit they will observe. Besides identifying the units to be observed, this form provides:

--Space to record the name and title code for each staff member in the unit.

--Space for each staff member to be checked off (accounted for) as they are observed on each round.

--Explanations of the Staff Title Codes, Action Codes, and Bed Codes used in the data collection effort.

Observation Data Form (Form HS-7, p. 62):

Observers will receive one observation data form for each hour of the shift. These forms will have the following entries recorded when the observer receives them:

--Page number.

--Observer name.

--Observer ID number.

--High room number.

--Low room number.

--Hospital ID number.

--Shift.

--Date (Gregorian and Julian).

--Times (24-hour clock).

--Rest and meal breaks will be indicated by crossing out the time periods provided for breaks.

Unit Sequence Card (Form HS-5, p. 64):

This card indicates the sequence in which the assigned units will be sampled for each day of the study period.

APPENDIX II

Exhibit 4

Site Supervisor Review (Initials) ☐

FORM HS-7

OBSERVATION DATA FORM

High room no. ☐☐☐☐ Low room no. ☐☐☐☐

Page 1 of 8

Observer ID 2 5 7 1 9 2 1 2 6 Observer FRANKIN

Hospital 0 3 5 Shift 2 Date 10 / 15 / 80 (Julian 289)

Mo / Day / Yr

JULIAN DATE	UNIT NO.	TIME (24-hr clock)	TITLE	ROOM NO.	BED	ACTION	BRIEF ACTION DESCRIPTION
289		0700					
		0702					
		0704					
		0706					
		0708					
		0710					
		0712					
		0714					
		0716					
		0718					
		0720					
		0722					
		0724					
		0726					
		0728					
		0730					
		0732					
		0734					
		0736					
		0738					
		0740					
		0742					
		0744					
		0746					
		0748					
		0750					
		0752					
		0754					
		0756					
		0758					

APPENDIX II

Exhibit 5

FORM HS-4

ROUND CHECK-OFF

OBSERVER (Name) FRANKLIN

NAMES AND TITLES
VERIFIED WITH UNIT SUPERVISOR/
CHARGE NURSE [ ] (initial block)
yes

HOSP ID 035
UNIT ID 2110
DATE 259
SHIFT 2

NAME	TI-TLE	ROUND CHECK-OFF 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

APPENDIX II

Exhibit 6

HS-5

OBSERVER FRANKLIN

UNIT SEQUENCE:

ID NO.	HOSPITAL REFERENCE	DAY	START UNIT
351	35A	1	352
352	35B	2	351
361	36C	3	361
362	36B	4	362
		5	361
		6	351
		7	352
		8	362
		9	361
EST. STAFF 36		10	351
		11	352
OBSERVATION FREQUENCY 2 min		12	362
		13	361
		14	351

MAKING OBSERVATIONS

The data collection effort will consist of a fixed time interval sample of the routine nursing staff members in the assigned units. As indicated earlier, the fixed interval will be 2, 4, 6, or 12 minutes, depending upon the number of staff members to be observed. At the initial time specified on the Observation Data Form (HS-7), the observer will enter the first unit in the assigned sequence and make the first observation. Succeeding observations will be made at the times specified on HS-7. Staff members in each unit will be observed in the order in which they are listed on the Round Check-Off Form (HS-4), and each member will be observed only once during an observation round.

At the moment of observation, the observer will determine the action being taken by the staff member and make the following data recordings:

--Check off the staff member's name, for that round, on the Round Check-Off Form (HS-4). This action will help insure that each staff member is observed only once during an observation round.

--Record the following on the Observation Data Form (HS-7):

-The unit ID number (this number may be duplicated, using a vertical line, for succeeding entries).

-The Title Code for the observed staff member. To facilitate identification of staff members and their titles, each member will be asked to wear a color-coded name tag indicating the following:

Title code	Title	Color
1	RN	Pink
2	LPN/LVN	Green
3	Aide	Yellow
4	Orderly	Orange
5	Graduate nurse	Blue
6	Ward clerk	Grey
7	Nurse technician	White
8	Other	Red

This information is also shown for reference on the Round Check-Off Form (HS-4).

-If the action being performed is a service for a specific patient, the patient's room and bed number will be recorded.

APPENDIX II

-The Action Code for the action being performed at the moment of observation. These codes are defined as follows and also shown on the Round Check-Off Form (HS-4).

(1) The staff member is performing a service for a specific patient, and is in the patient's presence. Examples of Code 1 include providing personal care, dispensing medication, monitoring vital signs, and assisting the patient's physician.

(2) The staff member is performing a service for a specific patient, but is not in the presence of the patient. Examples of Code 2 include preparing medication, charting, and obtaining supplies for the patient.

(3) The action being performed cannot be associated with a specific patient. Examples include meetings, conferences, lunch and break periods, and care provided to more than one patient simultaneously.

(4) The observer is unable to determine the whereabouts and actions of the staff member.

(5) The observer is unable to make an observation because the observer is traveling between wards or recording staff information on HS-4 at the beginning of a shift.
Note: For Codes 1 or 2, the room and bed number must be recorded.

-A brief description of the observed action.

These actions are repeated at the specified times on HS-7 until an observation has been made and recorded for each staff member in the unit. When this is completed, proceed to the next unit in the sequence, and commence recording observations at the specified times. THE OBSERVER MUST NEVER EXCEED THE SPECIFIED TIME SCHEDULE.

VERIFYING THE NURSING STAFF LIST

To allow for verification of the staff member list on the Round Check-Off Form (HS-4), nursing staff members will be asked to sign their name and title on a list at the nurses' station when they report to work in the unit. Observers will consult this list to enter the names on HS-4. The names must be verified with the unit supervisor/charge nurse.

LOCATING NURSING STAFF MEMBERS

In most cases, all nursing staff members will be easily located in the patient room areas, corridors, nursing station, and other areas within the nursing unit. If an observer is unable to locate a staff member, he or she must go to the nurses' station to determine the whereabouts and actions of the staff member. Nursing staff will be observed in the order in which they are listed on the HS-4.

MONITORING DATA COLLECTION

The previous day's data will be reviewed by the site supervisor as follows:

--Insure that all required data entries are recorded.

--Match action codes with the action description to insure that codes are properly used.

--Insure that room and bed numbers are recorded for all Action Codes 1 and 2.

--Tabulate a daily sample of observation codes to determine the ratios for each code. Make note of inconsistencies among observers, or questionable changes from day to day for an observer.

--Insure that the specified unit sequence is being followed and that staff member names are being properly checked off on HS-4 as observations are made.

--Initial each Observation Data Form, in the space provided, at the end of your review.

Noted discrepancies should be discussed with the observers before their observation rounds are started for that day.

In addition to this daily data review, site supervisors should periodically accompany observers during observation rounds to insure that the established procedures are being followed.

VIII. SUPPLY AND PERSONNEL REQUIREMENTS

This section presents estimates of the personnel and supply requirements for the study.

PERSONNEL REQUIREMENTS

From the test results, it is estimated that an observer can handle up to about 35 staff members on an observation round. Hence, observer personnel requirements for shift may be calculated by dividing the total staff by 35.

To estimate the total staff complement in a hospital, and the general distribution of this staff by shift, divide the number of beds by 2 to determine the total staff complement. Then, divide the total staff complement by 2 to determine the number of staff members on the day shift. The remaining staff are distributed on the evening and early morning shifts.

It is also estimated that four to five GAO personnel per hospital, a site senior, a supervisor for each shift--plus a possible additional person to assist in compilation of the hospital, patient, and nursing hours data--will be required.

SUPPLY REQUIREMENTS

The observers will require the following supplies:

--Name tag.

--Watch.

--Clipboard binder for data forms. This binder must allow for Forms HS-5 and HS-7 to be clipped side by side for easy cross-referencing.

--Pencils.

GAO site supervisors will require:

--Calculator.

--Julian calendar.

--Pencils.

--Access to a copy machine.

These supply requirements are in addition to the data forms and the guidelines that will be contained in the training materials.

APPENDIX II

FORMS

APPENDIX II

FORM HS-1

HOSPITAL SURVEY DATA

HOSPITAL ID ☐☐☐ HOSPITAL AGE (YRS) ☐☐

SURVEY PERIOD ☐☐☐ TO ☐☐☐ (INCLUSIVE) (JULIAN DATE)

NO. ROUTINE CARE CERTIFIED BEDS ☐☐☐ TOTAL NURSING UNITS ☐☐☐

NO. ELIGIBLE UNITS ☐☐☐ UNITS SAMPLED ☐☐☐

ROUTINE NURSING CARE CLASSIFICATION

CODE	CLASSIFICATION	AVERAGE HOURLY RATE

SHIFT HRS.

1 ☐☐☐☐ TO ☐☐☐☐

2 ☐☐☐☐ TO ☐☐☐☐

3 ☐☐☐☐ TO ☐☐☐☐

HOSPITAL ID | | | |

NURSING UNIT DATA

FORM HS-2

CODE NO.	UNIT DESCRIPTION	HOSPITAL REFERENCE	LOCATION	NO. BEDS	ROOM NUMBERS	NO. STAFF		
						1	2	3

APPENDIX II

FORM HS-3
Page __ of __

MAX ID
MIN ID
MAX RM NO.
MIN RM NO.

PATIENT DATA 72

HOSPITAL ID NO.

UNIT ID CODE (See List

NAME	PATIENT ID NO.	SEX	AGE	ROOM NO.	BED	IN		OUT		M	FROM	TO
						DATE*	TIME	DATE*	TIME			

* Use Julian Calendar

APPENDIX II

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PAGE

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FORM HS-4

ROUND CHECK-OFF

OBSERVER (Name)_____

NAMES AND TITLES VERIFIED
WITH UNIT SUPERVISOR/CHARGE
NURSE [ ] (Initial block)
Yes

HOSP ID _____
UNIT ID _____
DATE _____
SHIFT _____

NAME	TI-TLE	ROUND CHECK-OFF 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

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HS-5

OBSERVER _____

UNIT SEQUENCE:

ID NO.	HOSPITAL REFERENCE	DAY	START UNIT
		1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
		11	
		12	
		13	
		14	

EST. STAFF _____

OBSERVATION FREQUENCY _____

APPENDIX II

FORM HS-6

Hospital ID
Unit ID
Days in Sample

TIME RECAP

High Room No.
Low Room No.

HOURS BY TITLE

DATE	SHIFT	RN	LPN	AIDE	ORD	GRAD. NURSE	WARD CLERK	VOL. OR OTHER	NO. ROUNDS
	1								
	1								
	1								
	1								
	1								
	1								
	1								
	1								
	1								
	1								
	1								
	1								
	1								
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☐ Site Supervisor Review (Initials)

FORM HS-7

OBSERVATION DATA FORM

Page__ of __

High Room No. ☐☐☐☐ Low Room No. ☐☐☐☐

Observer ID ☐☐☐☐☐☐☐☐☐

Observer _____

Hospital ☐☐☐ Shift ☐ Date __/__/__ (Julian _____)

Mo Day Yr

JULIAN DATE	UNIT NO.	TIME (24-hr clock)	TITLE	ROOM NO.	BED	ACTION	BRIEF ACTION DESCRIPTION
		0700					
		0702					
		0704					
		0706					
		0708					
		0710					
		0712					
		0714					
		0716					
		0718					
		0720					
		0722					
		0724					
		0726					
		0728					
		0730					
		0732					
		0734					
		0736					
		0738					
		0740					
		0742					
		0744					
		0746					
		0748					
		0750					
		0752					
		0754					
		0756					
		0758					

APPENDIX II

FORM NS-8

OBSERVATION DATA

Page __ of __

OBSERVER_____ LOW ROOM NO._____ HIGH ROOM NO._____

HOSPITAL ☐☐☐ UNIT_____☐☐☐ DATE ☐☐☐ SHIFT ☐

TIME	CLASS	OCODE	ROOM NO.		BED

REMARKS

METHOD OF CALCULATING THE DIFFERENTIAL

The method of calculating the actual Medicare routine nursing salary cost differential is rather complex and yields results slightly different from what a more straightforward method of computation would produce.

To compute the differential, Medicare first computes an adjusted inpatient routine nursing salary cost per day equivalent to the following: 1/

(1) $$\frac{\text{(Total inpatient routine nursing salary cost)} \times 1.05}{\text{(Total inpatient days)} + (.05 \times \text{(aged + pediatric + maternity days)})}$$

Medicare then computes the average inpatient routine nursing salary costs per day by the following:

(2) $$\frac{\text{Total inpatient routine nursing salary costs}}{\text{Total inpatient days}}$$

A per diem differential adjustment factor is then obtained by subtracting the average inpatient routine nursing salary cost per day (formula 2) from the adjusted inpatient routine nursing salary cost (formula 1).

(3) (adjusted inpatient routine nursing salary cost)

minus

(average inpatient routine nursing salary cost)

This per diem differential adjustment factor (3) is then multiplied by the number of Medicare days to determine the actual Medicare routine nursing cost differential paid to the hospital.

This method of computation yields somewhat different results from a straightforward multiplication of 0.05 times total nursing cost.

1/For the differential before alteration by the Omnibus Budget Reconciliation Act of 1981, substitute 0.85 for 0.05 and 1.085 for 1.05 in these formulas.

Sample calculation for a hospital

Assumptions:

Total Routine Nursing Salary Costs = $2,000,000
Total Patient days = 95,000
Medicare Patient days = 38,000 = 40 percent
Non-Medicare Patient days = 57,000 = 60 percent
Aged + Pediatric + Maternity days = 42,750 = 45 percent
The adjusted inpatient routine nursing salary cost per day equals

$$\frac{\text{(Total inpatient routine nursing salary cost)} \times 1.05}{\text{(Total inpatient days + (.05 x (aged + pediatric + maternity days))}}$$

$$= \frac{2,000\ 000 \times 1.05}{95,000 + 2,137.5} = \frac{2,100,000}{97,137.5}$$

= $21.62

The average inpatient routine nursing salary cost per day equals

$$\frac{\text{Total inpatient routine nursing salary costs}}{\text{Total inpatient days}}$$

$$= \frac{2,000,000}{95,000} = 21.05$$

The differential adjustment factor equals

(Adjusted inpatient routine nursing salary cost)

minus

(Unadjusted inpatient routine nursing salary cost)

= $21.62 - $21.05 = $0.57

The amount of the Medicare routine nursing salary cost adjustment equals

(Per diem differential) x (Medicare patient days adjustment factor)

= $0.57 x 38,000 days = $21,660

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APPENDIX V

DATA ANALYSIS PLAN

SYMBOLS AND FORMULAS

Explanation of Symbols Employed

The letter y in the first position refers to a patient, or patients, 65 years old or older.

The letter x in the first position refers to a patient, or patients, less than 65 years old.

The absence of an "x" or "y" means that the symbol applies to both types of patients.

f = the replicate number, which can vary from 1 to 10.

g = the stratum number, which can vary from 1 to 4.

h = the sample hospital number, which can vary from 1 to the total number of sample hospitals in the stratum.

i = the observation day number, which can vary from 1 to 14.

j = the sample unit number, which can vary from 1 to the total number of routine nursing care units observed in a hospital.

k = the shift number, which can vary from 1 to 3.

m = the staff title number, which can vary from 1 to 8.

n = the staff member number, which can vary from 1 to the total number of staff members of a specific staff title on the observed shift.

q = the number of observations, which can vary from 1 to the total number of observations made on a specific staff member.

Each observed shift will be randomly assigned to 1 of 10 replicates. The letter f represents the replicate number. The letters g and h represent the stratum number and the number of the hospital within the stratum, respectively. To save space, these three letters will not be described in each definition.

Axg = weighted total staff wages per patient hour for patients < 65.

Ayg = weighted total staff wages per patient hour for patients ≥ 65.

Bfg = the total number of hospitals in stratum number g.

bfg = the total number of sampled hospitals in stratum number g.

Cxfghijm = staff wages per patient hour for patients < 65 for observation day number i, sample unit number j, staff title number m - all 3 shifts combined.

Cyfghijm = staff wages per patient hour for patients ≥ 65 for observation day number i, sample unit number j, staff title number m - all 3 shifts combined.

dfghijkm = average hourly wages paid on observation day number i, sample unit number j, shift number k, to staff title number m.

Exfghijkm = staff earnings for direct or indirect care given to patients < 65 for observation day number i, sample unit number j, shift number k, staff title number m.

Eyfghijkm = staff earnings for direct or indirect care given to patients ≥ 65 for observation day number i, sample unit number j, shift number k, staff title number m.

Mfgh = total number of routine nursing care units in hospital number h.

Mfghi = number of routine nursing care units observed on observation day number i.

Ofghijkmnq = all observations made on observation day number i, sample unit number j, shift number k, staff title number m, staff member number n, including observations of care not associated with a specific patient, but excluding missed observations and observations in which the whereabouts and actions of the staff member cannot be determined. (Observation number = q).

Oxfghijkmnq = an observation of direct or indirect care being given to a patient < 65 on observation day number i, sample unit number j, shift number k, by staff title number m, staff member number n. (Observation number = q).

Oyfghijkmnq = an observation of direct or indirect care being given to a patient $\geq$ 65 on observation day number i, sample unit number j, shift number k, by staff title number m, staff member number n. (Observation number = q).

Pxfghj = standard (constant) number of patients < 65 assigned to sample unit number j. (This quantity is a daily average of occupancy over the observation period and is the same for all observation days.).

Pyfghj = standard (constant) number of patients $\geq$ 65 assigned to sample unit number j. (This quantity is a daily average of occupancy over the observation period and is the same for all observation days.).

R = overall ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65.

Rf = ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65 for replicate number f.

Rmax = ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65 for the replicate in which this ratio is the greatest.

Rmin = ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65 for the replicate in which this ratio is the smallest.

s(R) = standard error of overall ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65.

Sxf = weighted average staff wages per patient hour for patients < 65.

Syf = weighted average staff wages per patient hour for patients $\geq$ 65.

tfghijkm = the number of staff hours on observation day number i, sample unit number j, shift number k, for staff title m.

Uxfghijk = number of patient hours for patients < 65 on observation day i, sample unit number j, shift number k.

Uyfghijk = number of patient hours for patients $\geq$ 65 on observation day i, sample unit number j, shift number k.

Wxfghij = weight for observations of direct or indirect care given to patients < 65 for observation day number i, sample unit number j.

Wyfghij = weight for observations of direct or indirect care given to patients ≥ 65 for observation day number i, sample unit number j.

Formulas

Weight for observations of direct or indirect care given to patients ≥ 65 for observation day i, sample unit j:

$$Wyfghij = \frac{(Bfg)(Mfgh)(Pyfghj)}{1.4\ (bfg)\quad (Mfghi)}$$

Weight for observations of direct or indirect care given to patients < 65 for observation day i, sample unit j:

$$Wxfghij = \frac{(Bfg)(Mfgh)(Pxfghj)}{1.4\ (bfg)\quad (Mfghi)}$$

Staff earnings for direct or indirect care given to patients ≥ 65 for observation day number i, sample unit number j, shift number k, staff title number m:

$$Eyfghijkm = \frac{(dfghijkm)(tfghijkm)\ \sum_{n}\sum_{q}\ Oyfghijkmnq}{\sum_{n}\sum_{q}\ Ofghijkmnq}$$

Staff earnings for direct or indirect care given to patients < 65 for observation day number i, sample unit number j, shift number k, staff title number m:

$$Exfghijkm = \frac{(dfghijkm)\quad (tfghijkm)\sum_{n}\sum_{q}\ Oxfghijkmnq}{\sum_{n}\sum_{q}\ Ofghijkmnq}$$

APPENDIX V

Staff wages per patient hour for patients $\geq$ 65 for observation day number i, sample unit number j, staff title number m:

$$Cyfghijm = \frac{\sum_{k=1}^{3} Eyfghijkm}{\sum_{k=1}^{3} Uyfghijk}$$

Staff wages per patient hour for patients < 65 for observation day number i, sample unit number j, staff title number m:

$$Cxfghijm = \frac{\sum_{k=1}^{3} Exfghijkm}{\sum_{k=1}^{3} Uxfghijk}$$

Weighted total staff wages per patient hour for patients $\geq$ 65:

$$Ayf = \sum_{g=1}^{4} \sum_{h=1}^{bfg} \sum_{i=1}^{14} \sum_{j=1}^{Mfghi} \sum_{m=1}^{8} (Wyfghij)(Cyfghijm)$$

Weighted total staff wages per patient hour for patients < 65:

$$Axf = \sum_{g=1}^{4} \sum_{h=1}^{bfg} \sum_{i=1}^{14} \sum_{j=1}^{Mfghi} \sum_{m=1}^{8} (Wxfghij)(Cxfghijm)$$

Weighted average staff wages per patient hour for patients $\geq$ 65:

$$Syf = \frac{Ayf}{10 \sum_{g=1}^{4} \sum_{h=1}^{bfg} \sum_{j=1}^{Mfgh} \frac{(Bfgh)(Pyfghj)}{bfgh}}$$

Weighted average staff wages per patient hour for patients < 65:

$$Sxf = \frac{Axf}{10 \sum_{g=1}^{4} \sum_{h=1}^{bfg} \sum_{j=1}^{Mfgh} \frac{(Bfgh)(Pxfghj)}{bfgh}}$$

Ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65:

$$Rf = \frac{Syf}{Sxf}$$

Overall ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65:

$$R = \frac{1}{10} \sum_{f=1}^{10} Rf$$

Standard error of overall ratio of staff wages per patient hour for patients $\geq$ 65 to staff wages per patient hour for patients < 65:

$$s(R) = \frac{Rmax - Rmin}{10}$$

APPENDIX VI

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MICHAEL STERN, MINORITY STAFF DIRECTOR

United States Senate
COMMITTEE ON FINANCE
WASHINGTON, D.C. 20510

August 14, 1981

Mr. Milton J. Socolar
Acting Comptroller General
of the United States
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Socolar:

Section 2141(a) of H.R. 3982, the Omnibus Reconciliation Act of 1981, amends section 1861(v)(1) of the Social Security Act to set a 5 percent limit on the inpatient routine salary cost differential reimbursable as an allowable cost of hospitals under medicare. (Since July 1, 1969, the differential has been established at 8½ percent by regulation.) Coupled with this modification, section 2141(b) provides that:

> "The Comptroller General shall conduct a study to determine the extent (if any) to which the average cost of efficiently providing routine inpatient nursing care to individuals entitled to benefits under Title XVIII of the Social Security Act exceeds the average cost of providing such care to other patients. The Comptroller General shall submit a final report with respect to the results of such study to the Congress within six months after the date of the enactment of the Act."

Section 2141 orginated as a Finance Committee amendment and was included as section 711 of S. 1377 as reported to the Senate on June 17, 1981. As indicated by the Finance Committee Report on S. 1377 (incorporated into the report of the Senate Budget Committee on the bill (S. Rept. No. 97-139)), this Committee clearly recognized that such a study as then contemplated by the GAO would be quite costly and would require additional financial resources--specifically funds to contract for temporary nursing personnel to make work sampling observations at the study hospitals, and that it would be necessary to appropriate supplemental funds specifically for that purpose. In this regard, the Committee also recognizes that the appropriation process can be a lengthy one which could significantly cut into the six months lead time provided in the Act.

The Committee understands that over the past several years various studies have been undertaken by others in the private and public sectors to assess the magnitude of a nursing cost differential (if any) for

caring for medicare patients. This raises the question as to whether the costly study contemplated by the GAO would be necessary to meet the needs of this Committee and the Congress. Therefore, to meet the statutory requirements of section 2141(b) of H.R. 3982 it would be acceptable if your Office provided to the Congress within 6 months of enactment a report which:

--summarized, analyzed, and critiqued all prior studies identified by GAO relating to the medicare nursing differential issue; and

--contained a detailed explanation of GAO's proposed study methodology, including estimates of the cost and GAO's perceived limitations on the results, as well as the views of interested public and private agencies as to the adequacy and feasibility of the proposed study approach.

I trust that this letter clarifies GAO responsibilities with respect to section 2141(b) of H.R. 3982.

Sincerely yours,

BOB DOLE
Chairman

BD:sbk

AMERICAN HOSPITAL ASSOCIATION
444 NORTH CAPITOL STREET N.W. SUITE 500 WASHINGTON, D.C. 20001 TELEPHONE 202 638 1100
WASHINGTON OFFICE

December 23, 1981

Gregory J. Ahart
Director
Human Resources Division
United States General Accounting Office
441 G Street, N.W.
Room 6864
Washington, D.C. 20548

Dear Mr. Ahart

The American Hospital Association, on behalf of its more than 6,100 member institutions and 30,000 personal members, appreciates the opportunity to review the General Accounting Office's (GAO) draft report to the Congress regarding the question of the existence and size of a differential in routine nursing costs between aged and younger hospital inpatients.

Attached to this letter are two documents. The first is a tabular summary of the studies reviewed by the GAO in the draft report with emphasis on the principal elements of GAO's critique of each. The second is a critique of the GAO report organized according to the logical sequence of the GAO's arguments, with particular emphasis on the Health Care Financing Administration's (HCFA) study.

As a summary our major findings of the report are:

- o GAO concludes that none of the studies reviewed are conclusive on the nursing differential issue. On an individual basis, we agree, although collectively the studies tend to accord the differential greater, rather than less, validity.

- o GAO concludes, however, that the recent HCFA study provides relatively strong statistical evidence that in the aggregate a cost differential does not exist. We disagree with this conclusion for two reasons:

  (1) The HCFA study contains a number of technical flaws which call into question its methodologic validity and the reliability of its conclusions with respect to its own hypothesis. These include interdependence among the explanatory variables and omission of certain variables, leading to potentially unstable estimates; sampling bias; and the possibility of population heterogeneity.

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GAO note: Page references in appendixes VII through X may not correspond to page numbers in this final report.

APPENDIX VII

(2) Even without these technical flaws, there is a fundamental error in the logic of assuming in any study that a differential only exists when it can be demonstrated in that aggregate that hospitals with high portions of Medicare patients have higher nursing salary costs. Individually and collectively, the following practical circumstances can result in Medicare patients actually receiving on average more nursing care per day despite any similarities one might find in aggregate routine nursing costs per day among hospitals with varying portions of Medicare patients:

- Hospitals in many parts of the country are experiencing shortages of nurses which can create artificial limits on how many nurses they employ irrespective of the portions of their beds occupied by Medicare patients.

- The Medicare program's Section 223 limits on the reasonableness of hospital routine care costs also creates an artificial constraint on how hospitals staff their routine care units, irrespective of the portions of their beds occupied by Medicare patients.

- Operationally, hospitals structure their nursing care staffing in a manner which will enable them to meet all patient care needs within a high degree of statistical probability. This, combined with the shortage of nursing resources, requires that nursing resources be treated as semi-variable costs, varying only where and when explicit, predictable changes have occurred in patient census, case mix or patient care needs. Temporary fluctuations in census and/or patient mix are primarily accommodated within existing staffing plans by using patient and nurse scheduling systems to allocate resources within the overall staff complement. Therefore, while the proportion of any given class or type of patients might fluctuate, aggregate nursing staffing will remain relatively constant over the short term.

o Based on the foregoing, and because of the large amount of dollars at stake, an updated nationwide study using management engineering techniques should be undertaken. GAO's previous efforts to design such a study indicate that this is possible. The relatively small amount of money necessary to implement the GAO methodology (4 percent of one year's differential) can easily be justified on a present value basis.

o AHA is willing to cooperate with GAO and other agencies in the development and implementation of a nationwide study of the differential. We believe that, given the collective weight of historical studies and the significant questions about the validity of the HCFA methodology, a comprehensive study must be undertaken before such a significant amount of money is arbitrarily removed from Medicare reimbursement.

APPENDIX VII

Again, the AHA appreciates the opportunity to comment on the draft report. If you have any questions regarding our comments, please let me know.

Very truly yours

Lawrence S. Goldberg
Director
Division of Financial Regulation, Analysis
and Liaison

jf

attachments

Industrial Engineering Studies

Study	Evidence of differential	Method	GAO's Critique
1966 AHA Study	yes (hours)	Work/Sampling	Old study, non-random hospital and nursing unit selection, included Thanksgiving and Christmas holiday periods, observers were hospital personnel.
Hosp. Corp. of America	yes (hours)	Patient activity category cross-tabbed with age groups.	Patient activity data not easily translated into hour and cost information, small V samples, systems may differ among hospitals.
Illinois Masonic	yes (hours)	" "	" "
Mass. Hosp. Assn.	yes (hours)	" "	" "
OHMS	yes (hours)	Task frequency study.	Measured hours rather than costs, done for limited group of hospitals.
Inter Mount H.C.	yes (hours)	" "	" "
Lewin & Assoc.	yes (hours)	" "	Small groups of hospitals, data collected by hospital personnel.
Miller & Byrne	yes (hours)	?	Not clear to what the differential relates, small group of hospitals.

From Covert's Paper as Cited by GAO

Oregon	yes	Measure hours not costs, some of the studies are based on patient activity systems.
Chicago-area teaching hospital	no	
Western multi-hospital system	yes (hours)	
Two upper midwest hospitals	yes (hours) (both)	

APPENDIX VII

Statistical Studies

Study	Evidence of differential	Method	GAO's Critique
CASH	Yes (hours)	Regression	Limited to California, hospital selection was not random, not clear that only routine hours included, measured hour not cost differential, no reported confidence interval, did not control for other factors.
HCFA	Concluded "no".	Regression	Explains only 40% of overall variation, unsettled cost report data used (latter point not mentioned in ch.2, only in appendix).
NJ Health Dept.	No (but researchers were looking within DRG groups).	Regression within major groups of DRGs.	ICU patients mix in, sample was non-random and small, more sophisticated NJ study is underway.
Levine and Phillip (AHA)	No, but were looking at proportion of county population over age 65. Study was not designed to measure differential.	Regression	Did not study proportion of patients age 65+, mixed special care with general units, evidence of unstable impact coefficients, measured hours not costs.

APPENDIX VII

APPENDIX VII

Comments on GAO Draft Report on the Nursing Differential

GAO Finding or Conclusion	Comment
I. "Overall none of the studies analyzed conclusively demonstrate either the existence or nonexistence of a differential" (summary, p.1) (GAO is referring to an industry-wide nursing cost differential.)	Individually this is true, although it should be noted that of the 17 studies reviewed by GAO, only two (the 1966 AHA study and the 1981 HCFA study) were even intended to measure the industry-wide differential. The remaining studies were more limited in geographic scope (some pertained only to one hospital) but virtually all found that Medicare patients received disproportionately more hours of nursing care than other patients.
II. The 1966 AHA industrial engineering study which formed the basis for the original differential. The GAO critiques the study's age, nonrandom selection of hospitals and units, use of hospital personnel as observers, and time period (for including Thanksgiving-Christmas interval).	An updated study would clearly be useful, and such a study could be designed to avoid the design problems noted by the GAO, although the real impact of the problems may well prove to be insignificant.
III. CASH vs. New Jersey Health Department studies. The GAO contends that the NJ study (which found no differential within DRG groups) is more reliable than the CASH study (which reported evidence of differential) (p.23). GAO does not give its reasons explicitly, but they seem to be: NJ looked at costs, NJ controlled for more factors and more clearly reported the statistical reliability of the results.	The New Jersey study's relevance to the issue at hand is reduced to the extent that the results were adjusted for such case mix factors as diagnosis, whether surgery was done, and treatment cost (the factors used in creating DRGs). The Medicare payment system does not adjust for such factors and these factors may well help explain why elderly patients require more nursing care. DRGs are intentionally designed so that patients within any DRG closely resemble each other in terms of resource use (i.e., DRGs are designed to produce the very result noted by GAO). The New Jersey study examined cost per case, while the nursing differential concerns cost per day. Also, as GAO notes, special care and routine costs were mixed.

GAO Finding or Conclusion	Comments
IV. Remaining studies (except HCFA)	
A. "... the remaining studies are too small and too limited for their results to be useful in determining whether a differential exists. All of these studies report a nursing differential, but in most cases in terms of hours rather than costs... In addition, all of these studies have limits which seriously impair their reliability..." (p.23)	A. Considering that all the studies do support at least an hour differential, the collective weight of this evidence should have a major bearing on the next policy decision, whether with regard to the size of the differential to be recognized or to the need for further research. Notably, all of the studies referred to in this comment have been based on actual observations and data collection within hospitals.
B. "... a differential in terms of hours of care does not necessarily mean a differential in terms of cost." (p.26)	B. The next logical step would be to extend the industrial engineering research to look at cost as well as hour differential on a nationwide study, incorporating and supplementing the best features of the recent Lewin study and the proposed GAO study.
C. "[Studies based on patient acuity systems]* do not address the relevant questions of actual care hours delivered and relative costs of those hours." (p.23)	The results of studies based on patient acuity systems are at least consistent with the existence of a differential. Such studies should, therefore, be considered in weighing the available evidence on a differential issue.
V. The HCFA study	
"This study is the most relevant and complete attempt to detect the existence and size of an industry-wide Medicare routine nursing salary cost differential to date. We believe that this study provides relatively strong, though not conclusive, evidence that little or no overall Medicare routine nursing cost differential exists." (p.21)	A. HCFA has a pre-established position on the issue (witness 1975 attempt at termination of 8-1/2 percent payment and HCFA position in subsequent law suit). B. Relevance: The study contains a fundamental logic error in its plan of attack. Assumes that if differential is real, then hospitals with high proportions of beds occupied by Medicare patients should have higher nursing salary costs, after adjusting for other key factors. This is not necessarily true, due to the following:

*Brackets indicate paraphrasing of GAO material.

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GAO Finding or Conclusion	Comment
	• Hospitals in many parts of the country are experiencing shortages of nurses which can create artificial limits on how many nurses they employ irrespective of the portions of their beds occupied by Medicare patients.
	• The Medicare program's Section 223 limits on the reasonableness of hospital routine care costs also create an artificial constraint on how hospitals staff their routine care units, irrespective of the portions of their beds occupied by Medicare patients.
	• Operationally, hospitals structure their nursing care staffing in a manner which will enable them to meet all patient care needs within a high degree of statistical probability. This, combined with the shortage of nursing resource requires that nursing resources be treated as a semi-variable cost, varying only where and when explicit, predictable changes have occurred in census, case mix or patient care needs. Temporary fluctuations in census and/or patient mix are primarily accommodated within existing staffing plans by using patient and nurse scheduling systems to allocate resources within the overall staff complement. Therefore, while the proportion of any given class or type of patients might fluctuate, aggregate nursing staffing will remain relatively constant over the short term.
	These practical circumstances alone could explain any contraditions in results between this type of study and the industrial engineering studies based on actual patient care data from hospitals. These circumstances also indicate why industrial engineering methods involving direct

APPENDIX VII

GAO Finding or Conclusion	Comment
	patient care data are more appropriate than regression techniques in analysis of the nursing differential. Given that HCFA has selected to use an indirect, statistical approach, it is incumbent upon HCFA to prove that it can indeed detect the existence of a differential.
	C. GAO criticizes the Levine and Phillip study for evidence of "unstable" impact estimates (p.15). Yet the same concerns apply to the HCFA study: • Sources of unstable estimates: - Interdependence among the explanatory variables. Likely candidates include: Medicare's share of total patient days, ratio of special care days to total routine patient days, Medicare patients' share of total special care unit days, number of RNs and LPNs per thousand bed days for hospitals' state, interns and residents per bed. Ideally, need single measure of hospital output, but it doesn't exist. The size of the estimated coefficients fluctuate with the inclusion (exclusion) of output proxies.

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GAO Finding or Conclusion	Comments
	- Omitted variables: If omitted variables are significantly related to the primary variable of interest (i.e., Medicare's share of routine patient days), its coefficient estimates will be biased and significance tests inappropriate. Examples might include, but are not limited to, hospital services, volume and case mix and the number and specialty mix of medical staff.
	Since the estimated impact for the key factor of interest is small, these sources of bias are potentially very critical and require very complete specification of the model. Such specification is difficult in the absence of a formal, well-developed theory of hospital staffing and its determinants.
	Evidence of potentially unstable estimates:
	• Estimated size of impact of Medicare proportion shifts with the inclusion of length-of-stay and case mix variables.
	• Lack of consistency among various impact estimates provided in the paper.
	• Low R^2 implies that there exist a number of significant omitted variables which might influence the variance of routine nursing salary cost from its mean.
	Thus:
	• Important differences among hospitals left unexplained

APPENDIX VII

GAO Finding and Conclusion

Comments

- If omitted factors are indeed important, the statistical tests in Fitzmaurice paper are invalidated.
- GAO suggests that the low R^2 may "simply reflect a large amount of random fluctuation in routine nursing salary costs among hospitals..." The randomness associated with the unexplained variation can be tested by applying a time series (ARIMA) process to this residual variation. HCFA reports no analysis of the residuals.

D. Sampling: The GAO report criticizes various studies for their particular sampling approaches. However, there are similar concerns with regard to the HCFA study:

- GAO criticizes various studies for nonrandom sampling, but does not note that the HCFA study had to exclude about 1/5 of the hospitals for lack of data. The HCFA data set thus becomes a nonrandom sample, and no data are provided on its representativeness.
- The HCFA study estimates hospital cost model with a sample overrepresented by larger hospitals. Expert opinion suggests the use of weighted least square technique to adjust for this sampling bias (without such an adjustment estimates might be biased).

E. Population heterogeneity: the GAO report agrees with HCFA claims that evidence of a nursing differential for Medicare patients is not prevalent.

- GAO overlooks the possibility that the primary variable of interest might impact routine nursing salary costs unevenly.

GAO Finding or Conclusion	Comments
	Evidence:
	- Chow tests conducted in HCFA study uses a partitioned (by bed size) universe which revealed statistically significant differences in the model estimates.
	- Conflicting population and sample results for the primary variable of interest.

Division of Economic Studies
Office of Public Policy Analysis
American Hospital Association
December 17, 1981

APPENDIX VIII

Hospital Financial Management Association

Ronald R. Kovener, FHFMA, Vice President

December 28, 1981

Gregory J. Ahart
Director
Human Resources Division
General Accounting Office
Room 6864
441 G Street
Washington, D.C. 20548

Dear Mr. Ahart:

The Hospital Financial Management Association (HFMA) appreciates the opportunity to submit the following comments on the General Accounting Office (GAO) draft of a proposed report on the Medicare routine nursing salary cost differential. HFMA has over 20,000 individual members who are financial managers of healthcare providers or who are closely associated with financial management activities of healthcare providers. These members are involved in evaluating and implementing Medicare payment policies and are, therefore, very much interested in the subject matter of this GAO report.

The proposed GAO report includes an analysis of completed studies relating to whether a cost differential exists and a summary of a GAO developed methodology that would be used in a proposed study of the same issue. The first part of HFMA's comments concern the GAO analysis of existing studies; the second part of our comments address the proposed GAO methodology.

Before proceeding with our detailed comments, HFMA wishes to again state our position with respect to Medicare payment of a routine nursing salary cost differential. Our members believe that a differential exists and that, for many hospitals, the current differential does not adequately reflect the higher level of nursing care required for elderly patients receiving services in routine patient care units. Numerous studies

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support the proposition that for many hospitals a differential exists; on the other hand, the several studies which indicate there is no differential are inconclusive and open to justifiable criticism of the methodology they employ. Therefore, the differential should be retained pending the completion of an objective, comprehensive study of the nursing care requirements of Medicare patients.

Analysis of previous studies

The GAO report is titled, "Conclusive Evidence that Aged Medicare Patients Receive More Costly Routine Services is Lacking." The text of the report clarifies that the GAO has concluded that "none of the studies analyzed demonstrate either the existence or nonexistence of a differential." We believe it is important to emphasize that the GAO analysis of existing cost differential studies (which included the American Hospital Association (AHA), Health Care Financing Administration (HCFA) and other studies) found that none of the studies were sufficiently rigorous to answer the basic questions which Congress has posed about the existence of a differential. While many HFMA members disagree with the GAO assessment of some of the studies analyzed, we feel it is appropriate to urge the GAO to take special precautions to help ensure the report will not be misinterpreted. Therefore, HFMA suggests that the report title be revised in this manner: "Conclusive Evidence of the Existence or Nonexistence of a Medicare Routine Nursing Salary Cost Differential is Lacking." This title, in our opinion, more accurately reflects the content of the report.

According to the report, only three of the studies analyzed were conducted on a sufficient scale to provide evidence about the differential on an industry-wide basis. Of the three, only the AHA study supports the existence of a differential while the other two studies (the Levine and Phillip study and the HCFA study) indicate that a differential does not exist. The report notes that the AHA and the Levine and Phillip studies are weakened by limitations, while the "HCFA study supplies relatively strong statistical evidence than an industry-wide differential does not exist" (p. ii). The casual reader is left with the impression that the HCFA study is not open to serious question and is not subject to limitations. This, of course, is not the case as explained in the subsequent text of the report. The report notes on page 21 and again on page 19 of Appendix I, that the HCFA study does not provide conclusive evidence that a differential is nonexistent. We recommend that the introductory material at p. ii be revised to more clearly indicate that the HCFA study is also subject to methodology limitations and is not conclusive on the issue of the existence or nonexistence of the differential.

The report states that the HCFA study is subject to some limitations. An HFMA task force reviewed the HCFA study and expressed serious reservations about the basic approach utilized by HCFA in conducting its study. The HCFA study is based on interhospital comparison of the proportion of Medicare routine days and average routine nursing salary cost per diems. A multiple regression analysis technique has been employed to determine whether there is a positive relationship between the proportion of Medicare routine days and the amount of the routine nursing salary per diem. This methodology is not appropriate to the issue of whether a differential exists. The rationale for the differential is the greater amount of routine nursing care required by Medicare patients when compared to other patients in individual hospitals. The better method for studying whether a differential exists is to analyze nursing time spent with aged patients as compared to nursing time spent with other patient groups within individual institutions.

HFMA notes additional problems with the HCFA study as follows:

1. As the GAO report states, the HCFA study explains no more than approximately 40 percent of the variation in per diem routine nursing salary costs. The use of interhospital comparisons based on multiple regression techniques results in findings which are affected by the independent variables selected by HCFA to explain routine salary cost per diem variations. Thus, the exclusion or inclusion of variables significantly impacts the study's conclusions. The use of this methodology is inappropriate when the variability of the dependent variable (per diem routine salary nursing costs) cannot be adequately explained either because important variables have been omitted or because data sources for important variables are unavailable. The HCFA methodology is particularly inappropriate when the work-sampling approach developed by the GAO will provide a more definitive study that is less subject to methodological deficiencies and more closely related to an investigation of the rationale which supports the payment of the present differential.

2. The HCFA study is based on 1979 information from cost reports that are subject to further adjustment in the cost report settlement process. Final adjustments to reported cost information could affect the study findings. This is a major limitation which would be avoided by the conduct of a study using the methodology proposed by the GAO.

3. Regulations effective for cost reporting periods beginning on or after October 1, 1980 significantly revised the definition of intensive care type units. Under current Medicare payment principles, a separate average cost per

diem is paid for services to Medicare patients receiving care in intensive care type units. The inpatient routine nursing salary Medicare cost differential is not paid for Medicare patients receiving services in intensive care units.

The new definition establishes restrictive staffing criteria and specifically excludes intermediate care units. Some hospitals with separate units which met previous criteria for separate payment as intensive care units will now have to treat these units as routine care units for Medicare cost reporting purposes. The result is a shift of the cost of caring for the more acutely ill Medicare patient into the routine area. This means that for some hospitals the payment of a differential is even more appropriate than it was in 1979. As noted above, the HCFA study is based on data from 1979 Medicare cost reports prior to the change in definition of intensive care units.

The GAO proposed methodology is not subject to this limitation because staff and patients in intensive care type inpatient units, as defined by the current regulations, will be excluded from the study.

Proposed GAO Methodology

The GAO developed methodology is a work sampling study that would be conducted in a stratified sample of 90 hospitals. HFMA believes that the work sampling approach is much more likely to result in a definitive study of the existence of a differential than the study prepared by HCFA. As explained above, the GAO methodology is not subject to some of the severe limitations which make the HCFA study conclusions suspect.

HFMA reviewed the proposed methodology in 1980 and submitted extensive comments on the methodology to the GAO in September 1980. Many of the concerns we raised in our initial review of the methodology have been addressed. The following are additional points which we believe need further clarification:

1. Observations will be coded into five categories. Codes 1 and 2 include nursing care activities directly attributable to specific patients. Code 3 includes activities not attributable to specific patients. The methodology is silent as to how Code 3 patient care observations will be assigned to patient groups. The number of observations that cannot be associated with specific patients will be significant. Accordingly, the methodology should describe how these activities will be treated.

2. Code 4 is used when the observer is unable to determine the whereabouts of a nursing staff member. Code 5 is used when the observer is unable to make an observation. The methodology does not explain how these observations will be utilized in the study.

3. The study will be performed for 14 consecutive days in each of 90 hospitals. The methodology does not explain when the observations will take place during the year. Seasonal fluctuations in hospital occupancy and the mix of patient groups could present problems in interpreting results. We recognize that the conduct of the study depends on the appropriation by Congress of funds necessary to complete the study and that this may influence the time of year when the study is performed. HFMA recommends that GAO plans for conducting the study take into account the need to ensure that the observations are not made during periods when seasonal fluctuations are likely to distort the study finding (e.g., Christmas holidays).

4. The sampling technique for selecting hospitals to be included in the study has been significantly revised from earlier proposals. We believe the revised sampling procedure is superior to the original procedure proposed in 1980. The use of a stratified random sample will help assure that the observations made in the 90 hospitals are representative of all acute care institutions in the United States. As we noted in our earlier comments, the inclusion of hospitals with little or no Medicare utilization would be inappropriate; the revised procedure will address this problem.

5. During the study, the GAO proposes to collect data on patient case-mix, length of stay, hospital size and location. According to the report, this information will be used to calculate the cost differential for hospital attributes such as size, location and case-mix. The GAO notes that the sample size may be too small to result in calculations that are stastistically significant. If the cost of collecting this additional data does not require significant expenditures of added funds or burden the hospitals participating in the study, we believe it is appropriate to collect the data. At the very least, some of the information may be useful in identifying variables that should be considered if future studies of the cost differential are required.

Summary

HFMA supports the GAO proposal to conduct a work sampling study to determine whether a routine nursing salary cost differential for Medicare patients exists. Our review of the most recent nursing differential study -- the HCFA study -- indicates that the HCFA study methodology is conceptually flawed and does not provide conclusive evidence of either the existence or nonexistence of a cost differential.

As in the past, HFMA stands ready to offer whatever assistance is necessary to ensure that a competently performed, unbiased study is satisfactorily completed. We would be pleased to discuss our comments in greater detail. Please contact me or Michael Palmer, Associate Director, Professional Affairs, for additional discussion.

Sincerely,

R. R. Kovener
Vice President

RRK/mlh

Federation of American Hospitals
Michael D. Bromberg, Esquire, Executive Director

National Offices 1111 19th Street, N.W., Suite 402
Washington, D. C. 20036 Telephone 202 / 833-3090

January 4, 1982

Mr. Gregory J. Ahart
Director
Human Resources Division
U.S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Ahart:

This is a response to your December 11, 1981, letter concerning your proposed report on the question of the existence and size of a differential in routine nursing costs between aged and non-aged hospital inpatients.

First, the Federation of American Hospitals, which represents the investor-owned hospital industry, comprising more than 1,000 hospitals and over 100,000 beds, concurs that a definitive study of this issue is needed. Your proposal which includes a sample of 90 hospitals for examination using industrial engineering techniques, we feel, should produce the most comprehensive results to date and we support a study similar to that outlined in your draft.

Next, we offer the following suggestions and comments for your consideration with regard to specifics of the proposal:

A. We believe the composition and stratefication of cell sizes be reexamined, particularly for those hospitals whose nursing salary differential costs are less than $100,000. We believe that a sample of five hospitals from a universe of almost 1,200 hospitals cannot yield valid results on which reliable national estimates can be made.

B. In selecting hospitals for the sample, a random basis is called for but the universe of all hospitals must be first screened to eliminate those types of hospitals where few, if any, Medicare patients are treated or where other Federal programs pay for the services: children's hospitals, maternity hospitals,

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Indian Health Service hospitals, etc.

C. With respect to your methodology that proposes random observation of nurses at particular points in time, we urge that you additionally include or even substitute random observation of patients at particular points in time. Studies conducted by Hospital Corporation of America's Center for Health Studies (the Federation's largest member) indicate that patient observations are just as important and should not be omitted from the methodology.

D. More detail is needed in your "Observation Methodology" starting on page 32, so that there can be no question of what is, or is not, patient care.

As a final comment, we take issue with your conclusion that while none of the studies to date conclusively shows the existence or non-existence of a differential, the recent HCFA internal study "provides relatively strong evidence that an industry-wide differential does not exist" (from page ii of your DIGEST). That report was based on Medicare cost reports, and not on observation/analytical techniques in a hospital setting, and should be treated as no better or worse than any other study.

Thank you for this opportunity to comment.

Sincerely,

Albert C Baker

Albert C. Baker
Deputy Director for
Government Relations
Federation of American Hospitals

ACB:rtm

APPENDIX X

The Catholic Health Association OF THE UNITED STATES CHA

1250 CONNECTICUT AVE NW
SUITE 234 • WASHINGTON DC 20036
202 - 296-3993

January 4, 1982

Mr. Gregory J. Ahart
Director
Human Resources Division
US General Accounting Office
Washington, DC 20548

Dear Mr. Ahart:

The Catholic Health Association is an association of hospitals and nursing homes sponsored by religious orders and dioceses of the Catholic Church. As a national association, it represents 619 member hospitals having 169,928 beds and 260 long-term care facilities having 32,670 beds.

We have carefully reviewed the General Accounting Office (GAO) draft report entitled, "Conclusive Evidence That Aged Medicare Patients Receive More Costly Routine Nursing Services is Lacking". Mr. Ahart, CHA is deeply dismayed by the draft report. In specific, we are dismayed by:

- The way the report characterizes the "2 percent allowance", the predecessor to the 8-1/2% nursing differential.
- The apparent acceptance at face value of the Fitzmaurice report on the nursing differential, and the conclusions drawn.
- The apparent absence of desire on the part of GAO to go forward with their original methodology.

In general, Mr. Ahart, CHA believes that if the report is promulgated as is it would serve to damage the institutional credibility of GAO and also serve as the basis for less than desirable process for the formulation of public policy on this issue and perhaps others.

Representing more than 600 hospitals and long-term care facilities nationwide

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APPENDIX X

The Original 2% Factor

On page 4 of the draft report there appears the following statement:

> (HHS) 1/ attempted to provide hospitals with a financial incentive to accept Medicare patients by allowing hospitals to be reimbursed at 102 percent 2/ rather than 100 percent of the total costs attributed to Medicare patients. The hospital industry claimed that 2 percent was inadequate and said as much as 7 percent was needed. However, HHS abolished this 2 percent additional payment beginning with July 1, 1969.

This statement is erroneous and willfully misleading. It continues to feed the erroneous assumption that Medicare is or ever was on a "cost-plus" reimbursement arrangement with hospitals and/or extended care facilities.

Medicare's early approach to cost-based reimbursement as delineated in "Health Insurance for the Aged, Principles of Reimbursement for Provider Costs", HIM-5, published by the Social Security Administration, DHEW (May 1966) describes this 2% factor as follows:

> An allowance is provided in recognition of the continuing need for capital funds to secure, preserve, and improve service-rendering capability. In part this allowance is in lieu of a direct return on net capital investment and in part is a recognition of various uncertainties that are inherent in the application of any cost formula at this stage of cost-finding capabilities. The allowance will apply to both nonprofit and profit-making organizations alike. This avoids the anomalous result that would arise from reimbursing a profit-making organization more than a service solely by reason of allowing a return on investment in one case but not the other. The allowance will be computed by taking 2 percent of total allowable cost (for purposes of determining this base, interest expense will be subtracted). The amount computed will be subject to the limitation that the total allowance not exceed a reasonable long-term interest rate on net capital investment.

CHA believes that in providing the historical context for background information on the 8-1/2% nursing differential it is both instructive and proper to refer to the "two percent allowance". However, that factor should be characterized as "an allowance in lieu of other costs" that Medicare and provider representatives agreed existed and should be reimbursed by the program but couldn't come to agreement on specific descriptions of such costs.

APPENDIX X

In a manner of speaking the 2% allowance grew out of a sense of "rough justice" on the part of Medicare representatives as to what Medicare ought to reimburse providers for the costs of caring for Medicare patients.

Chapter 2 and the Fitzmaurice Report

Chapter 2 is entitled, "Studies Do Not Adequately Support the Existence of a Medicare Differential". This chapter cites several existing large scale nation or state wide studies and refers to other existing studies done on a smaller scale describing the conclusions reached in these studies and the methodological weakness in these studies. The chapter concludes:

> In summary, although we believe that on balance the existing evidence tends to be against the existence of an industry-wide Medicare routine nursing salary cost differential, these studies, whether taken singly or together, do not provide irrefutable evidence either for or against the existence of such a differential.

In arriving at the conclusion, GAO places great weight on the HCFA study performed by Dr. J. Michael Fitzmaurice entitled, "A Statistical Analysis of the Medicare Routine Nursing Salary Cost Differential". The draft report characterizes the Fitzmaurice report:

> The study reported that an increase in the proportion of hospital routine patient days consumed by Medicare patients was not significantly associated with an increase in per diem routine nursing salary costs. It further stated that the size of the association identified and its lack of statistical significance do not support a Medicare routine nursing salary cost differential payment of 8-1/2 percent. Several other variables, such as regional location, type of hospital control (for example, governmental, non-profit, for profit), hospital occupancy rates, and local area wage levels, appeared to explain more the variation in per diem routine nursing salary costs across hospitals than did the proportion of routine Medicare patient days.
>
> Although this study represents the most ambitious effort to ascertain the existence and size of an aggregate Medicare routine nursing salary cost differential to date, it does have some limitations. At best, this analysis only explains about 40 percent of the variation in routine nursing cost per day. This low explanatory power may mean that potentially important variables have been excluded from the analysis. On the other hand, it may simply reflect a large amount of random fluctuation in routine nursing salary costs among hospitals which makes detection of a differential on an industry-wide basis difficult.

APPENDIX X

This study is the most relevant and complete attempt to detect the existence and size of an industry-wide Medicare routine nursing salary cost differential to date. We believe that this study provides relatively strong, though not conclusive, evidence that little or no overall Medicare routine nursing cost differential exists.

CHA, after having reviewed the Fitzmaurice report, believes that first the Fitzmaurice report included verbiage or prose conclusions that are too strong for the data in the Fitzmaurice report to support; and second, that because Chapter 2 places such "great weight" on the Fitzmaurice report it is inappropriate for GAO to state that:

> "...On balance the existing evidence tends to be against the existence of an industry-wide Medicare routine nursing salary cost differential...."

The Fitzmaurice Report Data and the Fitzmaurice Report

The regression results, as presented in the government's own research paper, do not adequately support the conclusions that have been drawn. The author states in the "Implications" section of the paper that:

> "The weak and inconsistent association between PMR and RNS does not support a conclusion that hospitals with proportionately more Medicare patients have significantly higher routine nursing salary costs ... The influence of PMR appears to be positive in Models II and III but not generally significant, especially for the log regressions.
>
> "In view of the extremely weak support for the existence of a positive and significant relationship between PMR and RNS, it is possible that no Medicare routine nursing differential exists. Correspondingly, this study finds little empirical evidence that it should be paid generally to all hospitals."

First of all, it should be noted that all of the regression equations were estimated using both linear and log forms. The author expresses preference for the log form, and it turns out that the log results favor the government's point of view in 7 of 9 cases 1/.

1/ In the tenth equation, the results were the same with either form.

The author's stated reason for preferring the log form is:

> "because of its appropriateness for hospital cost function analysis and the ease of interpreting the regression coefficients as elasticities."

"Interpreting the regression coefficients as elasticities" is referring to a process of quantitatively estimating the change in one variable that is associated with a given change in another variable (e.g., a hospital with 10 percent more Medicare patients estimated to have ___ percent higher nursing salary costs). CHA would submit that the ability to make such a conversion is an unacceptable reason for selecting the log form - it is simply irrelevant to the basic issue of wehther a differential exists. As for the first part of the sentence, "because of its appropriateness" for the type of study being conducted, CHA would submit that this statement is purely tautological. The author has not presented any methodologically-based rationale for his obvious reliance on the functional form that ends up backing the government's contention that the nursing salary differential is unwarranted.

In Table 4, the "Comprehensive Model" regression results for a universe data base of 4500 hospitals in 1979 are presented. Both the basic model ("Model III") and a modified version ("Model III-A") are presented, the latter differing only in terms of an average length of stay variable being added. The results of Model III-A strongly support the existence of a nursing salary differential. The proportion of Medicare patient days is found to be correlated with per diem salary costs at greater than the 99th percent confidence level in the linear form (not preferred by the author, as above), and at nearly the 90th percent confidence level in the log form.

In his opening discussion of Model III-A, the author himself supports its applicability by saying:

> "A hospital's average length of stay should be an important variable in explaining variation in RNS .... Hospitals with longer average lengths of stay are expected to have lower RNS values."

The author then seems to all but ignore the results of the model including an ALOS variable, prefering the Model which produces results more favorable to the government. He does state that the Medicare Cost Report data used to construct the ALOS variable may not be entirely reliable, implicitly leaving the industry to bear any adverse outcomes that might result from bad data.

Table 7 presents the "Comprehensive Model" results for a national sample of 1200 hospitals over the 1977 to 1979 period.

APPENDIX X

Concluding that these results provide "weak" evidence of the existence of a differential is simply not justified. First, "Model III" was used, which as noted above produced results more favorable to the government than did "Model III-A" in the universe study. Secondly, the linear form (again, not prefered by the author) showed that the proportion of Medicare patient days was correlated to per diem nursing salary costs at greater than the 95th percent confidence level was found in 1 of the 3 years studied.

The last portion of the study breaks the analysis down into four bed-size groups, in part to counter the fact that the national 1200-hospital sample is biased towards large hospitals. These results support the government's conclusion (similar to the results of the all-hospital analysis), but "Model III" rather than "Model III-A" was again used, leaving the reader to wonder whether the author simply selected the more favorable of two sets of outcomes for inclusion in the report.

The crux of our argument is that the conclusion of the HCFA study -- an 8.5 percent nursing differential being unjustified -- was drawn by a rather biased interpretation of the regression results.

The Proposed GAO Study

Chapter 3 of the draft GAO report minimizes the value of going ahead with the GAO study called for in Section 2141 of P.L. 97-35. The draft report indicates that GAO is reasonably confident that they could conduct a study which would yield acceptably precise reliable results about the existence and size of an aggregate Medicare routine nursing salary differential. However, it goes on to say that it was doubtful if GAO could develop from the size of the sample in the proposed study reliable conclusions about the existence of a differential in strata of hospitals or the influence of other variables on routine nursing salary costs. A study which answers the question of why such costs vary would need to be substantially larger and more expensive than the study described. The implication is that it is not worth going ahead with the GAO study.

CHA cannot agree with that implication. The Fitzmaurice study is inconclusive, but the data tends to contribute more to the support for the existence of a differential than to the absence of one. Without the GAO study as proposed, the Congressional/HHS policy making process is left exactly in the same situation which Section 2141 of P.L. 97-35 sought to avoid.

Summary, Conclusions, Findings

Summary:

CHA finds that the draft GAO report gives great weight to the Fitzmaurice study. After having reviewed the Fitzmaurice study we find that the verbiage and the conclusions in the Fitzmaurice study are too strong to be supported by the data in the tables. Our review of the data in the tables suggests that contrary to the Fitzmaurice conclusion "no support for the continued payment of the Medicare routine nursing salary differential is found", the data tend to contribute substantial support for the continued payment of a nursing salary differential. Therefore, the conclusions arrived at on page 23 of the draft GAO report "...That on balance the existing evidence tends to be against the existence of an industry-wide Medicare routine nursing salary cost differential..." are substantially weakened.

Given the above, CHA cannot agree with the implied conclusion in the draft that the proposed GAO study not be performed.

Conclusion:

CHA concludes that without the GAO study called for in Section 2141 of P.L. 97-35, the Congressional/HHS policy making process will be left to the seat of the pants political judgement call which Section 2141 sought to avoid. CHA strongly believes that the GAO proposed study ought to be funded and conducted.

Recommendation:

CHA recommends that GAO ought to revise the draft report, and that such a revision ought to reflect the following points:

1. Studies do exist that show that there is no justification for the Medicare routine nursing salary differential. More studies and stronger evidence exists which would contribute to support for such a differential. However, all such evidence, when viewed from an aggregate position or on nation-wide bases, are inconclusive.
2. Therefore, GAO, at this point, cannot prove or disprove the existence of a differential. To do so would require a study similar to the one proposed in Section 2141 of P.L. 97-35.
3. Such a study should be conducted by GAO so that resolution of the policy decision can be made on the basis of fact and reasoning.

Sincerely,

Patricia A. Cahill, JD
Vice President
Government Services

(106214)